

NASA CONTRACTOR REPORT 145238

**THE ENVIRONMENTAL
ANALYSIS OF HELICOPTER
OPERATIONS BY FEDERAL
AGENCIES: CURRENT
PROCEDURES AND RESEARCH
NEEDS**

(NASA-CR-145238) THE ENVIRONMENTAL ANALYSIS
OF HELICOPTER OPERATIONS BY FEDERAL
AGENCIES: CURRENT PROCEDURES AND RESEARCH
NEEDS (Duke Univ.) 62 p HC, A04/MF A01

N78-11519

CSCL 13B G3/45

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NASA Contractor Report 145238

August 1977

The research reported herein has been supported by a grant
from the National Aeronautics and Space Administration, Langley
Research Center, Grant No. NSG 1121.

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ABSTRACT

Since their inception in the early 1960's, commercial helicopter passenger operations have been plagued by high costs, poor ride comfort, and limited ridership. In recent years, the problems have grown further with the requirement that all federal actions which involve project funding, regulation, or research and development programs must undergo an environmental analysis. Although the Federal Government does not operate a commercial helicopter service, it regulates existing operations through the CAB and the FAA, carries out basic and applied helicopter systems research through NASA, and even subsidized a number of privately-owned commercial systems in the 1960's. Unfortunately, the environmental analysis procedures used by the various federal agencies to assess helicopter operations differ widely between agencies, suffer from a lack of analytical rigor, and fail to provide guidance for the types of technological and public policy investigations needed to overcome the environmental problems. The CAB, FAA, and NASA have done little more than rephrase the initial environmental policies stated in the National Environmental Policy Act of 1969 and elaborated by the Council on Environmental Quality in 1973.

This report reviews the technical, economic, and environmental problems restricting commercial helicopter passenger operations and indicates the existing environmental assessment procedures followed by the CAB, FAA, and NASA. The key considerations for effective assessment procedures are outlined and a preliminary model for the environmental analysis of helicopters is developed. It is recommended that this model, or some similar approach, be used as a common base for the development of comprehensive environmental assessment methods for each of the federal agencies concerned with helicopters. The paper concludes with a description of the critical environmental research issues applicable to helicopters and the recommendation that NASA take the lead in investigating these issues.

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ACKNOWLEDGMENTS

This paper is a continuation of a series of reports describing research investigations conducted at Duke University into various transportation aspects of helicopters. These investigations were supported by the National Aeronautics and Space Administration over the period January 1975 to December 1976. During this period, a number of graduate and undergraduate students, faculty, and staff were provided with the opportunity to participate in research related to the use of helicopters in civil air transportation. In addition, large numbers of students were exposed to issues of helicopter operations through class lectures which drew upon the on-going research activities. Overall guidance for the project was provided by Mr. William J. Snyder of the Flight Research Division at the NASA Langley Research Center. The authors wish to express their appreciation for his assistance and encouragement. Further thanks are due to the many aviation officials who provided information and comments on the environmental aspects of helicopter services. The typing of this report was ably done by Candace Warner.

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Chapter 1

CURRENT STATE OF COMMERCIAL HELICOPTER PASSENGER OPERATIONS

Background to Environmental Concerns

In the forty years since Igor Sikorsky first flew his basic rotorcraft in 1939, the helicopter has found wide use in the military, para-military (police, fire and emergency), financial, and industrial sectors. The initial dream of applying the helicopter to commercial passenger operations waned in the 1950's, however, as the helicopter industry remained unable to solve the problems of external noise, ride discomfort, and high fares. Taken together, these problems have severely limited ridership and route length. Helicopter passenger carrying capacity may soon be overcome by current research and development being conducted by both the Federal Government and private industry. At the same time, the likely boom in helicopter applications resulting from this research will create new problems and will require more federal involvement, especially in the area of environmental analysis. At present, however, federal involvement in existing passenger operations is very low.

Over the years 1954 - 1966, the Federal Government subsidized several privately-owned helicopter operations in major metropolitan areas in order to test and demonstrate passenger services. When federal aid terminated in the mid-1960's, these helicopter operations suffered greatly. Los Angeles Airways declared bankruptcy in 1970 and so also did San Francisco and Oakland Helicopter Airlines in 1971. The former was replaced in 1972 by Los Angeles Helicopter Services, which operates only as a charter and air taxi service. The latter was reorganized as SFO Helicopter Airlines and continued to provide scheduled passenger service until 1976, when the company announced its intention to go into liquidation because of union pressures and labor strikes. A third company, New York Airways has remained in operation throughout this period, but it has been continually troubled by an erratic market. And finally, a fourth company, Chicago Helicopter Airways, had to drop its scheduled passenger services and has remained in business primarily as an air taxi operator(8).

The operational worries of these firms that pioneered in scheduled passenger services were multiplied by the actual (and imagined) effects of new environmental legislation, especially the National Environmental Policy Act of 1969 (NEPA), the Air Pollution Control Act of 1972 (amended 1974), and the Noise Control Act of 1972. Subsequent to NEPA, the federal Council on Environmental Quality (CEQ) and the courts have emphasized that protecting and improving the "quality of the human

environment" includes social, cultural, and community impacts (6). This broad interpretation of "environmental impacts" has added yet another problem to the troubled history of the helicopter. Nevertheless, these new environmental policies pose no serious constraints to current helicopter operations because of the limited scope for effective action by the Federal Government and the corresponding difficulty in implementing federal policies (a point which is discussed in detail below). The key constraints on further development of helicopter service are the problems mentioned briefly at the outset of this paper.

Problems Affecting Commercial Passenger Operations

The unresolved problems of helicopter operations fall into two general categories: those which prevent wider economic application of the helicopter and those which prevent public (user and non-user) acceptance of the helicopter on non-economic grounds. Within these two general categories, it is worthwhile to ask what are the particular obstacles to further development of helicopter passenger services? There are four problems consistently recognized in the literature: high fares, long headway time, user discomfort, and non-user resistance to helicopter overflight and landings. These operate both individually and in tandem to keep helicopters from being more widely used.

High fares keep ridership limited. According to recent surveys, passenger helicopter services are used mainly by high income executives (8). People with higher incomes usually value their time more and generally are willing to pay more for time-saving services than people with lower incomes (1), as shown in Figure 1. Helicopters provide just such a time saving function, and the demand for helicopter service is fortunately quite inelastic. Demand becomes increasingly elastic as income decreases, but because current fares largely exclude the middle and lower income groups, the actual market remains inelastic. This was demonstrated in 1972 when a fare reduction by New York Airways had a negligible impact on ridership (8). If future fares are reduced enough to be within range of middle income groups, ridership should expand. However, until the point of inflection in the price-demand schedule is passed, ridership will remain relatively low and the market will continue to be inelastic. Once the point of inflection is passed a more elastic market situation will be reached and fare reductions will bring increasing ridership gains, as is illustrated by Figure 2.

Any improvements in helicopter technology which result in significantly lower fares will bring about a vast increase in the passenger use of helicopters, and at the same time, will increase the attendant environmental problems. At present, the market is inelastic, small, and restricted mainly to upper income groups. This small market with limited ridership makes it uneconomical to increase the frequency of service since additional flights simply would not be filled. New York

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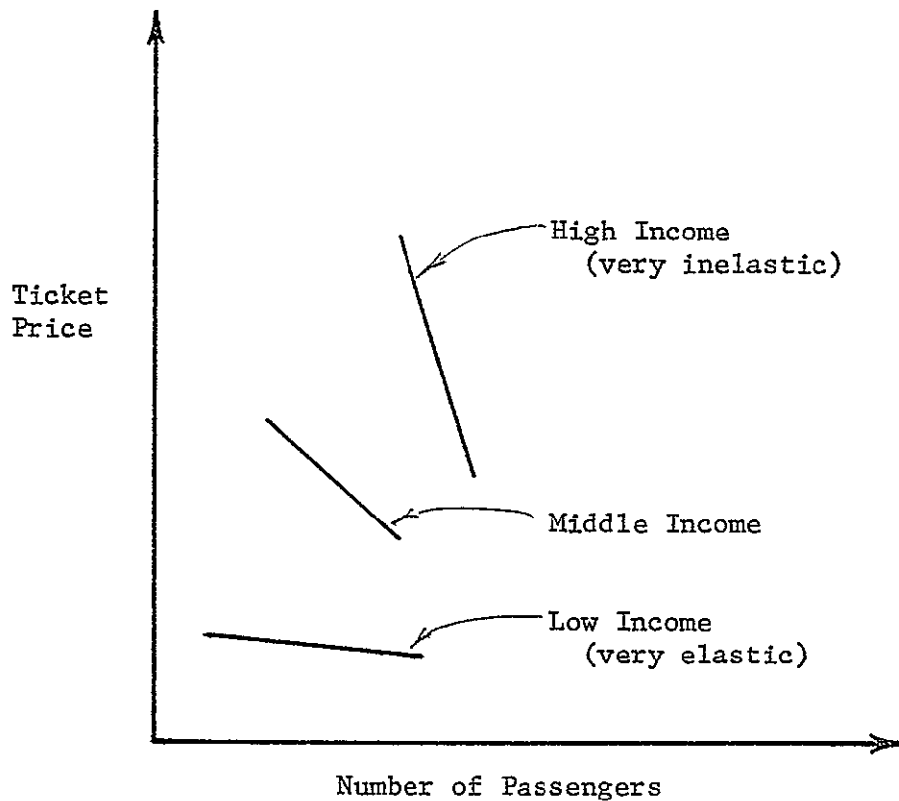


Figure 1. Assumed Income-Elasticity of Demand for Helicopter Passenger Services

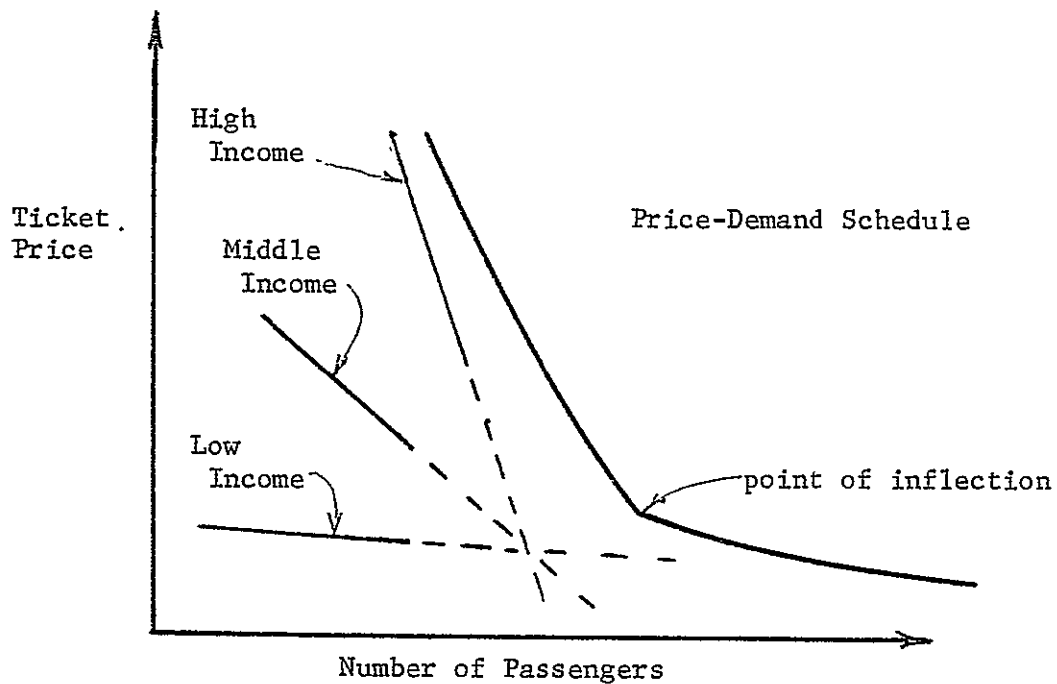


Figure 2. Assumed Price-Elasticity of Demand for Helicopter Passenger Services

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Airways, for example, is effectively limited by profit considerations to its current hourly schedule (26). In general, schedules having fewer than two flights per hour for very short haul runs create "headway" problems (8). That is, the time spent waiting for the next flight could have been used more efficiently on another mode of transportation.

Given that the main appeal of the helicopter is its time-saving potential, the headway problem is a serious liability. Delays reduce demand for the service and further exacerbate the ridership problem. And when ridership remains low, flight frequency remains limited. Increasing the flight frequency would tend to stimulate ridership by reducing headway -- provided, of course, that fares were low enough to generate the demand. Thus, the problem of headway is not merely one of inconvenience, but instead a real economic constraint.

Rider discomfort results from noise and vibrations inside the aircraft, and the effects of rider discomfort shorten the time people are willing to fly (16). For the most part, this rules out short-haul and intermediate-haul routes. A helicopter service limited to very short-haul routes fails to take advantage of one of its greatest potential markets, the center-city to center-city short-haul routes (1). An associated problem is aerodynamic in nature, involving drag which reduces the speed at which helicopters may travel. If helicopters travelled faster, passenger routes could be extended proportionally further before rider discomfort became a limiting factor.

The final problem area involves the question of public acceptance of helicopter overflights and heliport siting. The issues involved include (1) external noise from rotor design, (2) fuselage design resulting in rotor overlap on tandem models, (3) safety matters, such as requirements for visual flight reference (no instrumentational navigation permitted), (4) power decline at high altitudes, (5) temperature effects, and (6) air pollution. Environmental safety matters are not simply technical or governmental issues, they are of genuine community concern. These problems do not represent a direct economic impediment to the development of the helicopter; however, the public has the power through various regulatory authorities to retard the implementation of new technologies. No matter how acceptable a helicopter is to the community of users and non-users, if it is not economically self-supporting, it will not find widespread use. The key point is that the economic feasibility of the helicopter will precede federal consideration of the socio-political feasibility.

Needed Solutions

As the prospects for breaking through the economic barriers obstructing helicopter development are on the rise, so also are the prospects for solving the problems related to community acceptance of

the helicopter. The main economic barrier-- high fares-- results from two problems. One is the high maintenance-to-operating cost ratio, and the second is ineffective fuel consumption, that is, high operating costs stemming from low passenger miles per BTU of fuel consumption. The first problem is due to the high maintenance costs arising from the tremendous physical stresses in the rotors, drive shaft, and fuselage (8). The second problem involves the aerodynamic design of the fuselage. Less stress-inducing designs would reduce thermodynamic wastage, but more importantly, a larger and aerodynamically better-designed fuselage would require only small increases in engine power. Thus, both the passenger load per engine and the passenger-miles per unit-of-energy-consumed would increase. Figure 3 shows the combined effects of vehicle shape, engine design, and basic mode of travel upon energy requirements per passenger.

It is well recognized that an increase in energy efficiency would reduce operating costs and, thus, make lower fares possible. A decrease in physical stress also would reduce maintenance and would have a similar lowering effect upon fares. In general, the design of rotor, drive shaft, and fuselage and the construction of more efficient engines are the keys to solving these problems. Recent studies have emphasized that engine, rotor, and fuselage design are important in reducing noise and vibration (16). There is no doubt that the solution to existing noise and vibration problems would greatly increase the currently low community acceptance of helicopters. According to Dajani et.al., solutions to many of these technical problems will soon be possible:

Technological improvements, such as those resulting from the advanced systems described above, promise higher speeds and less maintenance costs due to rotor blades and rotor head improvements. The incorporation of IFR capability in aircraft and terminals will eliminate flight cancellations due to inclement weather. A larger scale of helicopter operations and longer helicopter hauls also can be expected to result in a reduction of both direct and indirect operating costs. Whether or not the demand necessary to support such operational growth will occur remains to be seen.(8)

As the day draws closer when helicopters will have the capability of playing a significant role in mass transportation, it is essential that early consideration be given to the potential impact of such aircraft upon the human environment and to the possible strategies for dealing with these impacts that can be adopted by the public and the government.

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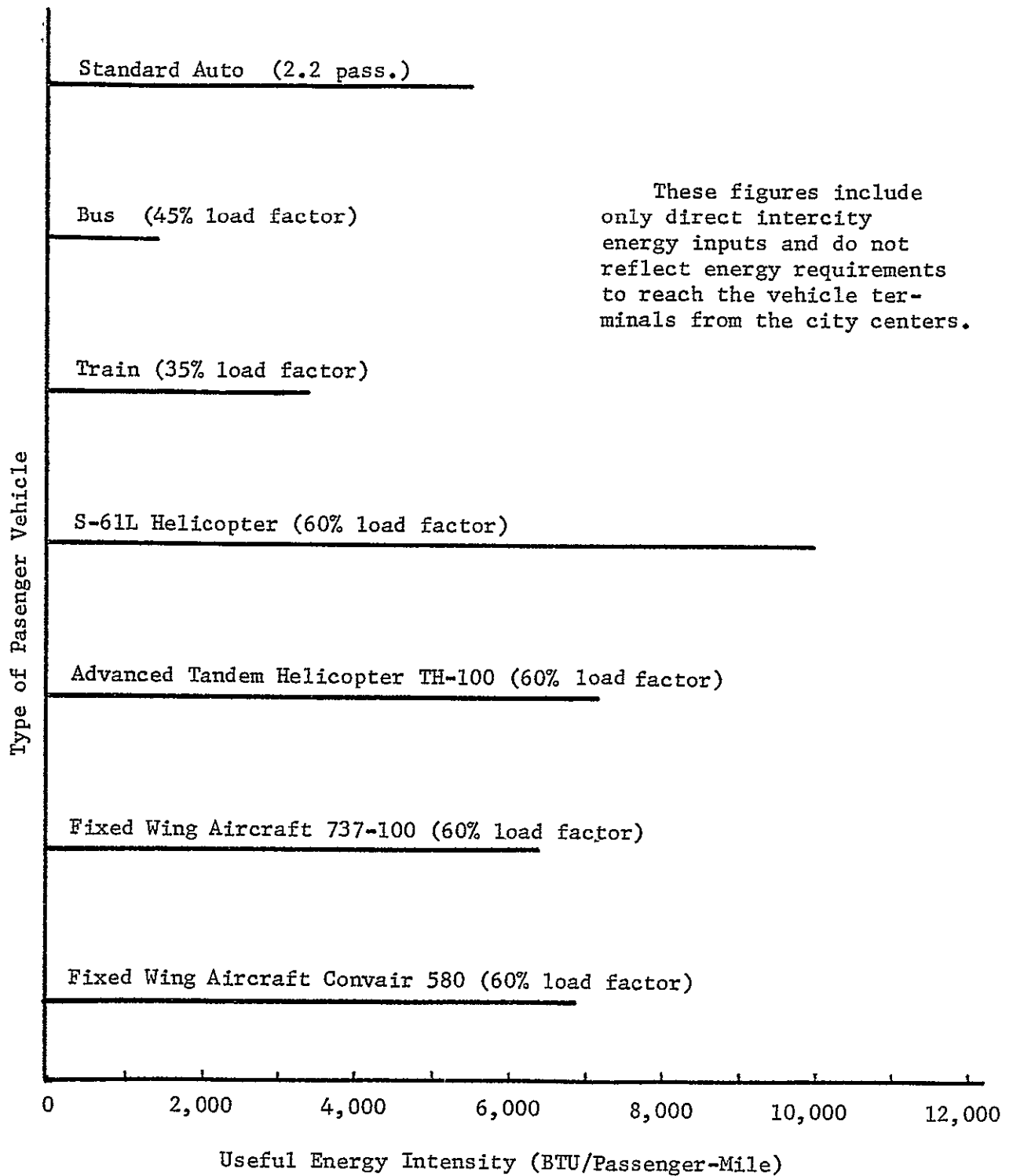


Figure 3. Comparisons of Useful Energy Requirements of Short-Haul Passenger Vehicles (New York to Washington).

Source: Adapted from (7).

Chapter 2

THE ROLE OF THE FEDERAL GOVERNMENT

Federal Involvement in Helicopter Operations

According to the guidelines developed by the Council on Environmental Quality, federal actions requiring environmental analysis include (1) significant federal funding for a project, (2) actions which regulate a project, and (3) research and development programs which lead to irreversible decisions or might strongly influence future decisions. Environmental analysis of this type is predicated on federal involvement, and a full, detailed environmental impact statement is required if the federal action is expected to significantly affect the human environment (5).

The Federal Government does not operate a civil helicopter passenger service, but if it did, the entire scope of the operation probably would fall under federal control. Moreover, this also would hold true if the Federal Government significantly subsidized a helicopter passenger service. Washington, however, has not supported such services financially since the expiration of subsidies in the 1960's. At present, federal involvement in commercial helicopter operations takes two forms: (1) general regulatory authority over commercial air travel, as exercised by Federal Aviation Administration (FAA) in the Department of Transportation and the Civil Aeronautics Board (CAB), which is an independent agency, and (2) research and development of helicopters as currently pursued primarily by the National Aeronautics and Space Administration (NASA). Armed services research and development for military use is a separate category which will not be considered here.

The CAB has been concerned with airborne civil transportation since its transformation from the former Civil Aeronautics Authority in 1948. Its responsibilities have varied over the years, but the CAB now is primarily concerned with the promotion of commercial air services. In this capacity, the CAB regulates the large airlines which service communities that would otherwise not receive air travel service. The regulatory function of the CAB takes the form of "certificates of public convenience and necessity," which grant the applicant the right to serve a particular route. This refers to point-of-origin, destination, and intermediary stops and does not refer to the in-flight path of the airplane. Within this regulatory responsibility, the CAB oversees the fares and schedules of the airlines. In evaluating helicopter routes, the CAB does not focus on either helicopters or aircraft but rather on the route stops, the number of passengers, the fares, and the schedules. Environmental

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considerations are decidedly secondary to the main CAB function, which is economic regulation. Within this economic function, the CAB possibly could subsidize a helicopter spur route, which is either a connecting route between two major airlines or a commuter service to unserved communities, but this has not been done to date.

The FAA was created in 1958 to take over the regulatory functions concerning safety which had been housed up to that time in the CAB and its predecessors. In 1970, the FAA was removed from the Department of Commerce altogether and transferred into the newly created Department of Transportation. The separation of economic (largely promotional) and safety (largely regulatory) responsibilities between two independent offices has been generally for the good (7). The FAA primary responsibility for air safety affects commercial operations in two ways: in-flight safety and take-off and landing safety, which includes both noise and air pollution considerations. If a particular aircraft has never been used in commercial service, it must be certificated by the FAA before it can be placed in use. Safety regulations, however, have been fully formulated only for very large and for commercial aircraft (Federal Aviation Regulation 135) and for small air taxi aircraft (Federal Aviation Regulation 121). At present, intermediate aircraft and helicopters are not regulated by general regulations but on a case-by-case basis. By 1977, FAA officials expect that federal regulations will be available to cover these areas. The criteria for safety are now firmly wedded to the environmental analysis procedure of the FAA. Other FAA actions concern the safety features of airports. In most cases, large airports can safely handle helicopter traffic, but the FAA has been sufficiently concerned with helicopters to promulgate voluntary guidelines for the siting and construction of heliports (1).

NASA has undertaken extensive research in improved helicopter technology in order to overcome barriers that prevent the wider use of the helicopter in commercial aviation. Though the research has yet to produce a marketable helicopter that would transform the commercial passenger service operations, there are indications that current research will do so in the near future (8). As pointed out in court cases and the CEQ documents, it is precisely this type of research with its associated public policy implications which requires the preparation of environmental impact statements. NASA policy is to put responsibility for environmental analysis on the office most directly involved in the research.

Federal Involvement in Environmental Impact Analysis

Formal environmental analysis of helicopters by the Federal Government varies between agencies. The regulatory actions of the CAB are greatly limited, generally involving approval of applications by airlines for authority to operate a particular schedule with

specific origins and end points. Normally, new applications are limited to route authorizations, which by themselves have seldom been regarded by the CAB as "major" decisions. The resulting actions of the CAB, therefore, cover route-by-route decisions, but not an entire commercial service as a whole. To date, there has been no case in which the CAB has performed an environmental analysis of helicopter operations (25).

The FAA, on the other hand, is concerned with much broader problems: airport design and air safety. The most direct effect the FAA has on helicopter operations is that it must approve all new types of aircraft before they go into use. In this regard, the FAA is empowered to carry out a full environmental analysis of the general impacts of each new aircraft, as was done in the case of the super sonic transport (SST), but it is not authorized to investigate particular impacts from airline to airline. Nor does the FAA have any absolute say about the fleet mix of already approved helicopter types. The FAA, like the CAB, has yet to analyze the environmental impacts of helicopter operations because no new aircraft types have been proposed for commercial use since the inception of the National Environmental Policy Act of 1969. The involvement of NASA in commercial helicopter operations is limited at this time to research and development of new aircraft types. As with the other agencies, no environmental impact analysis of current research and development has been done. Environmental analysis of research and development programs is a most difficult problem, about which more will be said later.

To a great extent, the lack of federal concern about commercial helicopter operations derives from the sparsity and small scale of existing operations. Once the economic barriers are overcome and helicopter operations begin to expand, the lack of specific guidelines for the environmental analysis of helicopters will become a problem.

Existing Federal Guidelines for Environmental Impact Analysis

(1) National Environmental Policy Act of 1969 (NEPA)

All existing federal guidelines relating to environmental analysis stem from the National Environmental Policy Act of 1969 (19). Title I, shown in Appendix A, states the purposes and basic outlines of NEPA. A key provision of the Act is Section 102, which directs all federal agencies to "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental arts in planning and decisionmaking which may have an impact on man's environment." Furthermore, the Act requires all federal actions significantly affecting the quality of the human environment to be preceded by a detailed statement describing the following five issues:

- (a) The environmental impact of the proposed action.
- (b) Any adverse environmental effects which cannot be avoided should the proposal be implemented.
- (c) Alternatives to the proposed action.
- (d) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity.
- (e) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

(2) Council on Environmental Quality (CEQ)

Title II of NEPA created a Council on Environmental Quality in the Executive Office of the President to assist in the implementation of the Act (19). The CEQ has the function of reviewing all programs and activities of the Federal Government in order to determine the extent to which they contribute to the purposes of NEPA. In August 1973, the CEQ published official guidelines for use by all federal agencies in the preparation of environmental impact statements. These guidelines required all federal agencies

....to view their actions in a manner calculated to encourage productive and enjoyable harmony between man and his environment, to promote efforts preventing or eliminating damage to the environment and the biosphere and stimulating the health and welfare of man, and to enrich the understanding of the ecological systems and natural resources important to the Nation. (5)

With the assistance of guidelines formulated by the CEQ, federal agencies were charged with developing a comprehensive environmental review process:

This requires agencies to build into their decisionmaking process, beginning at the earliest possible point, an appropriate and careful consideration of the environmental aspects of proposed action in order that adverse environmental affects may be avoided or minimized and environmental quality previously lost may be restored. (5)

Although the guidelines were left sufficiently general to apply to all federal activities, several basic steps were imposed upon all federal agencies, including (1) the preparation of an initial assessment, concurrent with initial technical and economic studies, of the likely environmental impacts of a proposed action, (2) the prepara-

tion, where required, of a draft environmental impact statement, (3) circulation of the draft statement for agency and public review, (4) consideration of the comments on the draft made by the agencies and the public, and (5) the issuing of a final environmental impact statement responsive to the comments received. In addition, the CEQ guidelines provided greater detail on the depth of analysis that had to be applied to the five environmental issues raised by NEPA. Appendix B contains that portion of the CEQ guidelines referring to the content required of environmental statements.

Draft environmental impact statements are subject to review by federal, state, and local agencies specified by the CEQ guidelines, as well as any other agencies having interest in the proposed action. Public review and participation by private organizations and individuals is another essential aspect of this process. The CEQ guidelines require a minimum interval of 45 days for interagency and public review of draft statements. All substantive comments obtained in the review process must be considered and addressed in the final environmental impact statement. There is a minimum interval of 30 days between the issuance of a final statement and the initiation of activity on the proposed action, although the overall period between the release of the draft statement and the taking of final action must be a minimum of 90 days (5). In practice, the review process normally exceeds the minimum stated in the guidelines.

(3) Civil Aeronautics Board (CAB)

Each of the three agencies which are directly concerned with civilian aviation have formulated their own environmental analysis procedures in light of the CEQ guidelines. The current CAB procedures were approved in September, 1975 (2) after more than two years of discussion and deliberation between the CAB, the CEQ, and the airline industry. These procedures arose out of the traditional airline certification function of the CAB and, consequently, incorporated a relatively narrow view of the process of environmental analysis. In general, this view can be characterized primarily in terms of aircraft activity, noise, and air pollution, as shown in Appendix C.

A major feature of the environmental procedures of the CAB is that applications for new aviation activities are supposed to proceed through a series of progressively more detailed analyses. Those activities which have little or no environmental impacts are quickly approved for implementation, while, in theory, those with environmental problems are retained for comprehensive investigations. The process begins when the CAB receives an application for certification of a new aircraft or for a change in a scheduled airline service. Unless the action is specifically exempted from environmental review, the application must contain an initial statement regarding the likelihood of adverse environmental impacts. Applications indicating that such impacts are likely to occur must be accompanied by an environmental evaluation, which includes a description of the proposed service

changes, associated technical information, resource commitments, and the results of a Pollutants Screening Test and a Noise Screening Test. These latter two tests are used to determine whether the proposed action will exceed specific threshold levels for pollutant emissions and noise. The threshold level for pollutant emissions is defined as an expected change in the ambient air quality, measured at the airport boundary, of one percent of the primary national air quality standards for each of four different types of pollutants: carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NO_x), and suspended particulates (S.P.). The corresponding threshold level for noise is defined as an anticipated increase of 17 percent in the land area affected by the noise of aircraft operations. If either of these tests shows that the threshold is exceeded, an environmental impact statement is required. However, if neither test signals potential environmental problems, no further environmental investigation need be performed, and the CAB can issue an "environmental rejection" or an "environmental negative declaration".

A finding by the CAB of an "environmental rejection" indicates either (1) that the proposed federal action is not major in character or (2) that the resulting environmental effects are inconsequential. An "environmental negative declaration" signifies that the proposed action does not meet the conditions for an "environmental rejection", but at the same time a subsequent environmental impact statement is not necessary. In the event a comprehensive draft impact statement is found to be warranted, the CAB may require the applicant to provide further preliminary information in the form of an environmental assessment. It is only after all preliminary reviews are concluded that the CAB or the applicant develops the comprehensive environmental impact statement, which must pass through both a draft and a final stage as required by the CEQ guidelines.

In practice, almost all recent applications to the CAB for new aircraft certification or for changes in aviation service have resulted in "environmental rejections" or "environmental negative declarations". This piecemeal approach to environmental change, however, fails to account for the cumulative effects of a series of small changes, all of which by themselves are within the threshold limits for aircraft emissions and noise. For example, it is possible for the CAB to approve the applications of several airlines to increase their levels of service at a given airport. Individually, each airline may be able to show that it will affect the ambient air quality by less than one percent of the national standard for a specific pollutant, but together all of the airlines could cause the change to exceed the threshold value, thus causing a significant environmental deterioration. The traditional promotional role of the CAB in aircraft certification has resulted in a screening process which is sensitive to the effects of an individual aircraft or airport activity but not to the cumulative effects of all activities.

With regard to helicopters, the CAB has received no applications for new certifications since the passage of NEPA in 1969. Thus, the authority of the CAB to evaluate and control the environmental impacts of aircraft under current environmental guidelines has not yet been applied to helicopters.

(4) Federal Aviation Administration (FAA)

In contrast with the environmental procedure of the CAB, that of the FAA is both more comprehensive and more rigorous. The FAA has overall responsibility for national aviation system planning from the standpoints of safety, capacity, productivity, environmental protection, and energy conservation (15). In the environmental sphere, the FAA expects all analyses to be interdisciplinary, to embrace a wide range of concerns, and to give particular attention to community concerns. This approach stems in part from the historic role of the FAA in maintaining strict regulatory control over aviation safety and in part from its administrative location within the U.S. Department of Transportation (DOT). Over the years, the DOT has gained wide experience in the preparation of environmental impact statements. In general, DOT policy is to presume that the bulk of its actions will have significant effects on the environment*, and therefore it does not focus on disproving impact, as does the CAB. This healthy respect by the DOT for environmental impacts may have been generated by the many legal battles that have arisen over controversial highway projects. Whatever the reason, the general environmental provisions of the DOT have been broadened by numerous transportation laws that require all of its constituent offices to show explicit concern for land use and urban growth, for noise, air, and water quality, and for a wide variety of economic, environmental, social, and transportation interests of affected communities (20). This attitude of environmental concern has been incorporated into the aviation guidelines and regulations of the FAA.

A major distinction between the environmental procedure of the CAB and the general guidelines of the DOT is the explicit recognition by the latter that minor individual federal actions may have major cumulative environmental consequences. Although very similar in content to section 1500.6 (a) of the CEQ guidelines from which they were drawn (5), the DOT guidelines for environmental analyses clearly state the need for an impact statement whenever such consequences are anticipated:

... It should be noted that the effects of many Federal decisions, including related Federal actions and projects in the area, can be individually limited but cumulatively considerable. This can

*

As indicated in DOT Order 5610.1B, "Procedures for Environmental Impacts", September 30, 1974, and DOT Order 1130.2, "Annual Unified Work Programs for Intermodal Planning," 1973.

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occur when one or more offices over a period of years put into a project individually minor, but collectively major, resources; when one decision involving a limited amount of money is a precedent for action in much larger cases or represents a decision in principle about a future major course of action; or when several Government agencies individually make decisions about partial aspects of a major action. In all such cases, an environmental statement should be prepared if it is reasonable to anticipate a cumulatively significant impact on the environment from Federal action. (20)

The effect of the above approach is to view proposed actions within the broad context of overall environmental quality rather than specific action-related environmental change.

The FAA procedures for environmental analysis follow the broad pattern set by the DOT. Although the FAA has not required any particular formula for the preliminary screening of noise and air pollution impacts, a good deal of attention has been given to these issues since 1969 (10). The most recent overall policy on aviation noise abatement was published in November 1976 and promulgated as a noise compliance rule in January 1977 (11). Of greater importance, however, is the fact that the FAA has established a comprehensive approach to overall environmental impact evaluation (14) which avoids the piecemeal methods of environmental screening characteristic of the CAB procedure. The FAA procedures, published in the Federal Register on August 12, 1976, are based upon the 1973 CEQ guidelines, but the intent of NEPA is highlighted through the use of specific aviation-related measures. Particular emphasis is given to the measurement of noise (section 324) with lesser emphasis given to air quality, water quality, social impacts, and land use, as shown in Appendix D.

According to the new FAA procedures (14), noise exposure must be measured by one of three methods: (a) peak level in dB(A), (b) time duration above a reference noise level, and (c) an aggregate noise measure, such as Composite Noise Rating (CNR), Noise Exposure Forecast (NEF), Day/Night Level (Ldn), or Equivalent Noise Level (Leq). In addition, the noise analysis must show the present condition, the condition forecast without the proposed change, and the condition forecast with the proposed change. Noise analyses generally fall into the categories of airport and runway siting, jet aircraft arrivals and departures, and miscellaneous actions. A noise analysis must be prepared for runway and airport locations which cause areas to have noise exposure above NEF 30, Ldn 65, or CNR 100. Additional information on peak noise levels, the average duration above given levels, and the frequency of occurrence is required for noise sensitive areas affected by jet flight segments within 3000 feet of the ground surface. For non-jet aircraft and stationary sources, only peak noise levels and frequency of occurrence in noise sensitive areas is required. The procedures generally exempt small noise changes (less than 2dB or 1 NEF) from

the requirement of a formal noise analysis. However, in contrast to the CAB, all FAA actions which cause accumulated, incremental noise changes to exceed NEF 30, Ldn 65, or CNR 100 must undergo a noise analysis.

Although the FAA procedures make no specific reference to helicopters or helicopter systems, they apply to all qualifying federal actions regarding aircraft and aviation activities. Therefore, it is logical to assume that the environmental regulation of commercial helicopter operations are included within the powers of the proposed regulations.

As in the case of the CAB method, the FAA environmental procedures contain a series of progressively more detailed analyses (14). The initial step is an "environmental impact assessment," which is prepared during the initial planning stage by an organization outside the FAA. This report is intended to analyze the likely environmental effects of a proposed federal action. The second step is a "preliminary environmental review" of the proposal by the FAA. This review involves a site visit and a search of available information sources, but no documentation is required except as required to identify potentially adverse environmental impacts and controversies. Depending upon the outcome of the review, the FAA can proceed to the third step and prepare either a "negative declaration" or a "draft environmental impact statement." The negative declaration is a statement that the proposed federal action will not significantly affect the quality of the human environment, and consequently, no environmental impact statement is required. A negative declaration may consist of a simple statement or, according to circumstances, a comprehensive document similar in detail to a formal environmental impact statement.

In the event that significant environmental effects are expected, the FAA is required to prepare a "draft environmental impact statement", which, after appropriate review and comment by the public, is then revised as a "final environmental impact statement." The format of the environmental impact statement is similar to that outlined by NEPA in 1969 (19) and further detailed by the CEQ in 1973 (5).

The FAA has yet to receive any applications for certification of helicopters for commercial use. Despite this fact, it is reported that FAA is developing standards for evaluating helicopters for certification (23). Given its current concerns, however, any future applications for helicopter certification probably will cause the FAA to focus upon both the traditional areas of aircraft safety and the newer issue of community acceptance of helicopter noise. (23). This latter issue, however, will not be easily solved. According to Munch and King in their study of the problems involving community acceptance of helicopter noise, there are "no reliable methods" for predicting community responses (14). Unfortunately, there does not seem to be any serious concern within the FAA over the problems of helicopter noise. The

environmental impact statement prepared by the FAA as a prerequisite to approval of the new noise compliance regulation of January 1977 made no mention of helicopter operations.*

(5) National Aeronautics and Space Administration (NASA)

NASA is engaged primarily in the research aspects of aircraft and aviation systems development and has almost no direct role in the field of commercial aviation. As such, however, NASA is subject to section 1500.6 (d)(2) of the CEQ guidelines regarding major federal research activities:

Agencies engaging in major technology research and development programs should develop procedures for periodic evaluation to determine when a program statement is required for such programs. ... This evaluation should be periodically updated, particularly when significant new information becomes available concerning the potential environmental impact of the program. In any case, a statement must be prepared before research activities have reached a stage of investment or commitment to implementation likely to determine subsequent development or restrict later alternatives.(5)

Within NASA, the civil helicopter program, which deals with the adaptation of existing military aircraft to commercial uses as well as the development of newer advanced helicopters, is subject to the above environmental guidelines.

The environmental guidelines of NASA require that all new or revised agency activities include consideration of environmental impacts. Proposals for major actions must be accompanied by an environmental assessment identifying potentially significant effects on the quality of the human environment. While the NASA criteria for environmental assessments are tied closely to section 1500.6 of the CEQ guidelines, "good judgment and reason" are the bases on which these criteria are to be applied (18). The assessments are expected to be conducted at the same time as the initial technical and economic studies in order to incorporate environmental considerations into the earliest stage of proposed actions. The NASA guidelines caution that some environmental assessments are likely to be incomplete because the nature of research and development projects causes new environmental parameters

*It should be pointed out that the FAR Part 36 Compliance Regulation of January 1, 1977, dealt only with aircraft weighing over 75,000 pounds and thus does not apply to existing helicopters. However, the FAA aviation noise abatement policy document of November 1976, which should apply to all aircraft, also omitted any specific reference to helicopters.

to arise as the work progresses. In any event, assessments must describe their own deficiencies and the activities planned to overcome them. As circumstances change, such assessments are subject to continuing revision, a process of "utmost importance" according to NASA (18).

Some environmental assessments will lead to the conclusion that there is no essential environmental impact, while others will require a new or revised environmental impact statement. This decision normally is made by the NASA official responsible for the proposed activity. Since 1971, research activities conducted at NASA field installations have been defined by NASA as "major federal actions" subject to environmental impact statements. NASA periodically prepares "Institutional Statements", covering each field installation, and "Program Statements", covering more specific research studies. These broad statements serve as an environmental umbrella, under which environmental assessments focus on relatively circumscribed activities or facilities. When an assessment so indicates, NASA prepares a separate environmental impact statement either as an amendment to the existing institutional or program statement or as a separate document (18).

To date, NASA has not yet become involved in the direct application of helicopter research to actual commercial passenger operations. As a result, there has been little pressure upon NASA to be concerned with the environmental impacts of the ultimate research results. Considerable efforts have been devoted to the problems of rider discomfort, vibrations, and noise, but specific criteria for the environmental acceptability of these problems are lacking.

Commentary on Federal Environmental Guidelines

The Federal Government has been officially concerned with the overall effects of its actions upon the quality of the human environment for less than eight years. During this period, little official attention has been given to the environmental aspects of commercial passenger helicopter services. Poor markets and generally unsuccessful operations have provided little incentive to the development of environmental assessment procedures for helicopter services. In view of past experience with regard to both the helicopter industry and public services in general, the development of federal guidelines tends to lag behind the overall growth of an activity or service affecting the public. If, therefore, active federal involvement in environmental assessment is dependent upon the presence of an expanding industry, relative federal inactivity should not be unexpected when industries are declining or stagnant, as is the case with existing commercial helicopter passenger operations.

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The picture may not be as bleak as first appearances would indicate. Both NASA and the FAA are actively engaged in technical research related to helicopters. Along with the work being done by the helicopter industry itself, current research efforts are approaching the point where many technological barriers to the wider use of helicopters are about to be overcome (16). Among those under study, some of the more important issues include noise and vibration reduction, ride comfort, fuel usage, flight range, speed, and passenger capacity.

Taken as a whole, however, the environmental analysis methods of the Federal Government applicable to commercial helicopter operations are uneven in their focus, depth, and breadth. This is even more true with regard to environmental assessment procedures applicable to helicopter research studies. Available guidelines for assessing the impact of helicopter research programs, while directed towards the fundamental issues of technology and public policy, suffer from a lack of detailed analytical guidelines. No federal agency has formulated any environmental methods for assessing helicopter research programs beyond a simple rewording of section 1500.5 (d)(2) of the CEQ guidelines (5).

Since the ultimate success of commercial helicopter operations is likely to be based upon the outcome of current research activities, and especially those investigations being conducted by NASA, there is great need for rigorous methods of predicting future impacts of technological improvements. NASA, as the lead research-oriented agency, has the major responsibility for developing such methods. The need for these environmental guidelines will become even greater in the future. By acting now to initiate studies aimed at determining how to assess the environmental impacts of helicopter research, NASA will be able to guide the technological investigations into channels more likely to result in solutions which are environmentally sound and acceptable to the affected community.

Chapter 3

A MODEL FOR ENVIRONMENTAL ANALYSIS

Assessment Needs

Evaluation implies the concepts of measurement and comparison. The evaluation of the environmental impacts of helicopter operations basically means that certain helicopter-related characteristics are assessed by one or more pre-determined measuring scales. Measurements can be carried out to determine either the relative degree of a characteristic or simply whether the characteristic meets a specified standard. By specifying a measurement limit below which the characteristic is unacceptable, a criterion for acceptance or rejection can be established. The concept of an acceptance criterion can be broadened to include the entire set of measurement scales, thus providing a range of criteria for accepting or rejecting the environmental impacts of helicopter operations.

Before helicopter operations can be evaluated, the relevant variables must be identified and the necessary measurement scales constructed. This section will point out some of the important factors regarding the development of variables and their corresponding measurements.

The evaluation of any type of helicopter-related system, including both research programs and subsequent commercial operations, is greatly determined by the measurements incorporated into the process. Since measurements generally are costly, the complexity and extent of the measurement process should be matched with the purpose of the evaluation. As a general rule, it is assumed in this report that the environmental variables for helicopter operations should be simple, valid, causal, definitive, and informative. In addition, the scoring system for these variables must reflect these basic characteristics.

(1) Simple measurements

In order to avoid the need for highly specialized environmental assessment experts or for extensive retraining of federal personnel, the environmental variables should be understandable and easy to apply. Measurements should specify data which are generally available, or at least readily generated by observation or by reference to other sources of available information. In addition, the data should be as objective and quantitative as possible. This will insure the reliability of the measurements when carried out by different personnel.

(2) Relevant measurements

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Measurements should be specified in units relevant to the variable in question. Helicopter activity variables, for example, are logically measured in terms of flight hours or aircraft operations. Similarly, airport facilities can be assessed according to the availability of designated features, such as runway size, fuel storage, parking spaces, etc. Where appropriate, monetary measures can be used to assess travel costs, airport revenues, and possibly opportunity costs of alternative actions, but no attempt should be made to force all variables into a monetary context. Once the initial measurements have been made in relevant units, the entire set of environmental variables can be made commensurate through a weighting system which determines the relative priorities of the variables.

(3) Causal measurements

In order to strengthen the validity of the environmental variables to accurately measure the important environmental impacts of helicopter operations, the variables should closely link the actual operation of helicopters to the ultimate environmental outcomes. Since impact linkages between helicopters and their ultimate effects on the surrounding community can become difficult to follow in the surrounding milieu of human activities, strong quantitative relationships should be emphasized. Primary impacts, or system efficiency measures, are more causally related than secondary impacts, or system effectiveness measures, which in turn are stronger than the ultimate environmental impacts. Wherever possible, variables should be identified which allow measurement of the direct effects of the helicopter operations. This will improve the overall validity of the measurement process and make the resulting conclusion regarding environmental acceptability less subject to irrelevant or spurious factors.

(4) Definitive measurements

Acceptance, as well as rejection, of an helicopter operation is likely to have far-reaching consequences upon the future development of commercial passenger services. For this reason, the environmental variables should be definitive and free of subjective interpretation. A definitive and unambiguous decision will be more readily accepted by all concerned parties and will help to avoid controversies over the process of helicopter evaluation. To attain this end, the measurements need to be objective and causally related, while the evaluation process needs to be replicable by different observers and understandable to the aviation community.

(5) Informative measurements

Ideally, the environmental variables should do more than merely assess the impacts of a proposed helicopter system. They should lead to a review of the strengths and weaknesses of the proposed operation. The measurements taken for each variable should give a direct assessment of the degree to which certain characteristics are occurring or

will occur. Moreover, the results of the analysis should indicate the environmental aspects of the proposed helicopter operation - needing the greatest improvement. In addition, a primarily quantitative measurement and evaluation system will allow a direct comparison of specific helicopter variables or even entire helicopter systems. Such a comparison could lead to a priority ranking of proposed helicopter operations according to their contributions to overall environmental quality.

(6) Variable scoring

Decisions regarding the environmental acceptability of helicopter operations must be based upon some system of scoring the variables contained in the assessment. A variety of methods for translating the measurement data into overall system decisions are possible. One method involves the use of only those measurements which have the same basic unit, such as dollars or some common aeronautical unit. This unit measure approach has the advantage of additivity, in that all measurement results can be summed together to give a single overall helicopter measure, but it also has the major disadvantage of being too narrow and limited to validly assess the varied contributions of a proposed helicopter operation to the national interest. Another method of scoring involves retaining the identities of individual variables in terms of the specific measurement units used on them. Instead of obtaining a single overall helicopter measure by summing all of the variables together, the final decision concerning environmental acceptability can be based upon a review of the total set or profile of individual variables. The advantages of this method are that the variables continue to be expressed in specific measurement units and their identities are not lost in either a generalized or unitary scoring system. Unfortunately, the resulting non-additivity of variables also means that a great deal of subjective judgment must be used to reach a final decision on the proposed operation.

A third method of scoring involves the establishment of a generalized point system, whereby the variables are weighted according to their relative importance and allocated a maximum number of points on the basis of these weightings. Such a system is additive and produces a final overall system measure. In addition, the system is more comprehensive than the unit measure method described above, because all of the different measurement units are incorporated into the generalized point score. Value judgments must still be made in weighting the individual variables, but they are made prior to the actual evaluation of proposed actions. Thus, value judgments are subject to both discussion and modification independent of field evaluations.

It may be that the generalized point system described above is the best available method of scoring the environmental impacts of helicopter operations. Since value judgments cannot be completely avoided in any environmental scoring system, it is advisable to make

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them as explicit as possible. The explicit allocation of variable weights not only indicates current priorities but also provides a built-in flexibility to adjust to future policies and priorities. Furthermore, a generalized point system utilizing specific variable weightings also gives clear-cut results that are less subject to subsequent disagreement or controversy. The variable weights, however, are dependent upon the following considerations: (1) existing national goals, especially those relating to national air transportation needs, (2) current federal objectives, especially those concerning the development of a national aviation system, (3) resource limitations, primarily those of personnel, time, and agency funds, and (4) the measurement issues discussed earlier.

Model Development

Any model developed for evaluation purposes is useful only as long as it provides either (1) organization and a degree of order to a hitherto confused situation or (2) improved capabilities for predicting the future responses of the system. Hopefully, a model of environmental impacts arising out of commercial helicopter operations can be formulated to serve both ends. Not all models are functional, but they should provide at least some descriptive insight into the process of environmental analysis.

In the case of commercial helicopter operations, as well as helicopter research studies, a discriminating model is needed to distinguish the various consequences of the proposed actions and, in addition, to show the basic relationships between resource inputs into helicopter development or system operation and the subsequent achievement of project or system objectives. Such a model should incorporate considerations of the efficiency, effectiveness, and ultimate environmental impacts of helicopter operations.

(1) Public Systems Evaluation Model

A useful basis for the development of an environmental assessment procedure is the Public Systems Evaluation Model, shown in Figure 4, which classifies system performance within three hierarchical levels (21). The first, or efficiency, level contains only physical inputs and outputs under the direct control of the researcher or system manager. The inputs are the primary resources invested in the project, such as labor time or number of aircraft, while the outputs are the primary

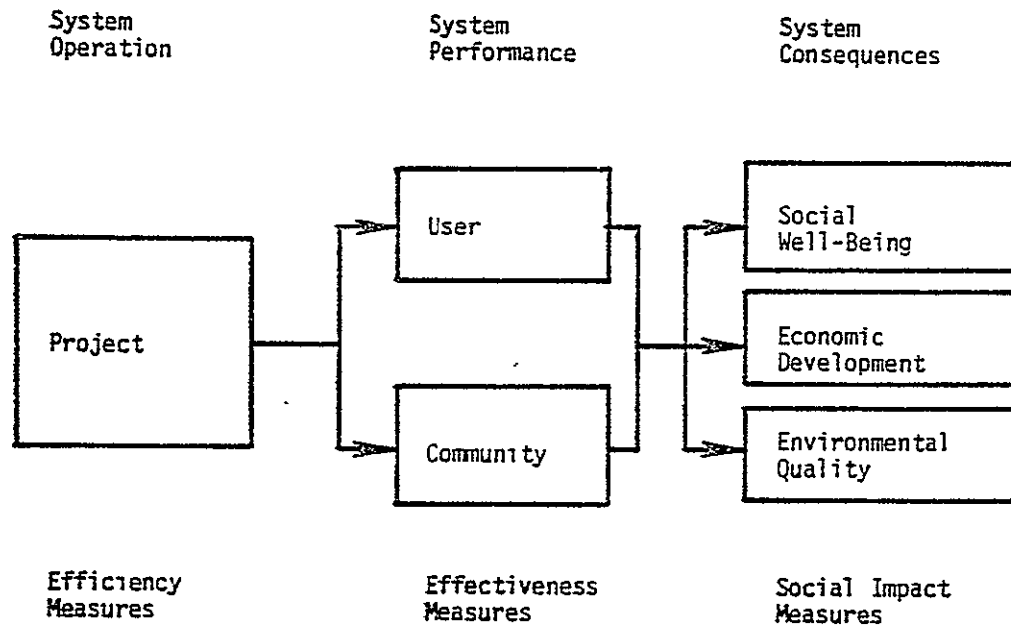


Figure 4. General Outline of the Public Systems Evaluation Model.

results of the project, such as system capacity, hours of operation, or maintenance facilities. The efficiency of the system can be defined as the ratio of the primary outputs to the resource inputs, which results in such measures as output per man/day or cost per building unit. The outputs of this first level become an intermediate input into the second, or effectiveness, level.

Effectiveness is measured primarily in physical terms also, but there must be some interaction between the efficiency level outputs and the general public for the effectiveness outputs to occur. In helicopter systems, the local community or metropolitan area comprises the market where the services of the helicopter are bought and sold. Typical helicopter effectiveness measures include total revenues per year, annual hours flown, or annual operations. While the system manager has almost total control over outputs at the efficiency level, he can control only indirectly the outputs at the effectiveness level. Effectiveness outputs are direct secondary effects which occur when the intended public uses the primary project outputs generated at the efficiency level.

The third level of project outputs, the impact level, is largely beyond the control of either systems managers or planners. Because of the interrelationships between technology, social structures, public policies, and human values, the influence of helicopter systems extends beyond the immediate operation of the system and has far-

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reaching effects upon society in general. A variety of impacts occur in the social, economic, and environmental areas. These impacts are the secondary and indirect consequences of the project upon the community and region. Since the impact level includes the ultimate consequences of helicopter systems, outputs at this level may involve changes in social well-being (public health, social opportunities, community attitudes), economic development (employment opportunities, new business formation), and environmental quality (noise levels, air quality, land use).

Thus, helicopter systems can be evaluated at three levels of performance. The efficiency level, which is of concern primarily to design engineers, is measured in terms of physical output per unit of input resources. The effectiveness level, which is of interest to system planners, is measured in terms of usage of the direct project outputs by the public. And lastly, the impact level, which is mainly the concern of policy-makers, is measured in terms of project-induced changes in social well-being, economic development, and environmental quality.

(2) Applications to Helicopter Systems-

A simplified application of the Public Systems Evaluation Model to the environmental assessment of helicopter systems is shown in Figure 5. Helicopter systems can be viewed as affecting three classes of people - the business firm itself, the users or customers of the service, and the community at large. The business firm includes all employees and investors in the operation. These individuals generally are concerned about environmental issues only insofar as they affect the efficient technical operation and ultimate commercial profitability of the system. This is the efficiency level, and the environmental effects upon this group can be said to be under the complete control of the system, engineers and operators. This is not strictly true, of course, but individuals in this group at least have the choice of either remaining with the business and accepting the environmental effects or leaving the business and avoiding any adverse environmental situations.

The second group includes the users of the helicopter system. These are the people who choose to ride helicopters presumably because of the advantages they offer over other forms of transportation. Environmental issues affect this group in a way which either enhances or detracts from the desirability of using the helicopter as a means of transport. The primary environmental issues of concern are noise, rider comfort, and safety. This level is the effectiveness level, because the users must choose to ride the helicopters if the technical (or efficiency) outputs of the system are to provide any beneficial results. The system planners may be able to predict the degree of acceptance of the system by the users, but they cannot control the effectiveness level because they cannot force people to ride helicopters.

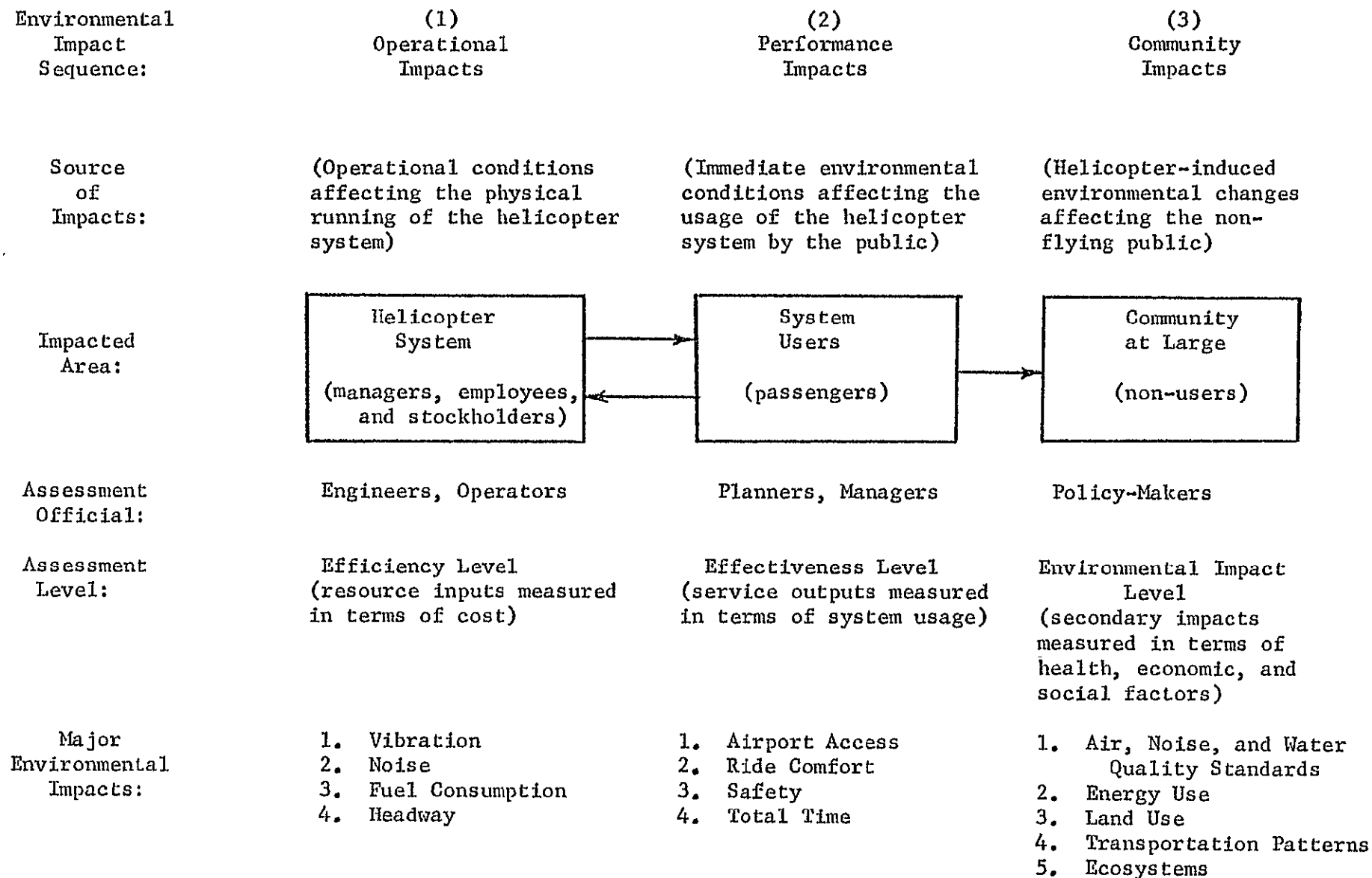


Figure 5. A Model for the Environmental Assessment of Helicopter Systems.

Thus, both the efficiency and effectiveness levels are marked by environmental concerns which affect only a relatively small set of people - the system operators on the one hand and the system users on the other. In both cases, association with or usage of the helicopter system is voluntary, and each individual is free to weigh his continued participation in the system against possible adverse environmental effects. The environmental consequences occurring at the efficiency and effectiveness levels, therefore, can be considered to be the primary environmental impacts of helicopter systems.

The third group includes the community at large, which can be considered to be composed of non-users of the helicopter system but whose environment nonetheless is affected by the system. The environmental impacts experienced at this level are in the category of "free goods", since the enjoyment (or suffering) of environmental effects by one individual has no direct influence on the experiences of others. Typical environmental impacts falling within this category include changes in air quality, noise levels, and public land use. Fortunately, many of these impacts can be linked directly to helicopter systems. This cause-and-effect linkage allows a more immediate identification and assessment of environmental problems than is the case in most other types of public systems.

A number of categories of environmental impacts are relevant to helicopter systems. The first includes the standards for air quality, noise levels, and water quality that have been established by the CAB, FAA, NASA, and the Environmental Protection Agency. These are the only areas in which quantitative national standards have been developed. The process of environmental analyses in other areas is still very much an "art" subject to the knowledge and experience of the analyst and the relative environmental conditions of the locality in question. The second category of environmental impacts includes changes in energy usage and the natural resource requirements of helicopters and associated ground transportation, such as autos, buses, and trains.

Land use is the third category of environmental impacts. It includes land-related changes affecting urban development, agricultural activities, parklands, recreational areas, wilderness areas, historic places, and archeological sites. The changes in land use can come directly through expansion of the airport or indirectly through modification of transportation patterns or socio-economic conditions near the operational areas of the helicopter system.

A fourth category involves changes in transportation patterns to and in the vicinity of airports. These changes may include aviation routes, highways, and mass transit routes. In addition, some people, especially the elderly, the handicapped, and the poor, will have special problems of access to the airport and to areas of employment, commerce,

and recreation. Lastly, the fifth category of environmental impacts consists of changes in biological ecosystems. Plants, animals, birds, and fish can be adversely affected by nearby helicopter operations. Because biological communities often are highly interdependent, a change in one may cause a series of related changes in many other systems. This category also includes changes in human use and enjoyment of natural ecosystems.

The environmental assessment model shown in Figure 5 summarizes the above classifications. Impacts occur at the initial efficiency level (operational impacts), the subsequent effectiveness level (performance impacts), and the final environmental impact level (community impacts). The first level involves system operation, which is the physical operation of the helicopter system by the system operators and engineers. From the standpoint of the project engineer, the main environmental issues are those which affect technical performance and operational costs. The second level involves system performance, which is dependent upon the usage of the helicopter service by the public. The system planners and managers are concerned about environmental issues insofar as they affect system usage and overall commercial profitability. From the users standpoint, the main environmental factors are those affecting access to the system, ride comfort, and general safety. The third level involves secondary system consequences, which are the environmental impacts of the helicopter system upon the non-user public. As articulated by the policy-maker, the environmental concerns of the public include quality standards, energy usage, land use, transportation patterns, and ecosystems.

With the aid of the above environmental assessment model, a rapid identification of potential impacts can be made in the preliminary planning phases of proposed helicopter operations. It is important to be aware of the differing environmental concerns held by the system operators, system users, and the community at large. These concerns are influenced by the relationship of the individual to the helicopter system and by the degree of control held by the individual over the system. Both operators and users are forced to accept the primary environmental impacts of helicopter operations, but at the same time they have the power to either change the nature of the system or to avoid it altogether. As a result, the environmental concerns of these two classes of individuals narrow to a small subset of key issues which affect only their immediate interests. On the other hand, the community at large has no direct interest in helicopter operations, and it is unable to either change the system or avoid its environmental consequences. The issues of concern, therefore, remain broad-based and often poorly identified. For this reason, the identification and assessment of environmental impacts at this third level is often extremely difficult.

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There are a number of characteristics unique to helicopter systems that assist in the identification and subsequent assessment of environmental impacts. Because of the relative smallness of helicopter operations in comparison with the overall aviation system, the environmental impacts of helicopter systems tend to be highly visible and, thus, potentially easier to manage. At major airports, for example, the environmental consequences of helicopters are almost marginal to the larger impacts caused by the dominant fixed wing aircraft. Relatively few airport features, such as overall size, design standards, or noise criteria, are determined by helicopter usage. Almost all such factors are based solely on the performance characteristics of fixed wing aircraft and the need of the public to utilize the services of these aircraft. Thus, the environmental changes in air quality, noise levels, and land usage caused by helicopter operations at most airports are generally only marginal contributions to the larger mass of similar impacts caused by fixed wing aircraft. At the larger airports, the environmental changes caused by helicopters have the greatest effect upon the helicopter system operators and the users of the airport and the least effect upon the community at large. These are the primary environmental impacts described above.

Secondary environmental impacts become important when the community at large is directly affected by helicopter operations. This occurs in situations where the helicopter is the dominant feature, such as at heliports and under helicopter flight paths. In such cases, the contribution of the helicopter to the observed changes in air quality, noise levels, and land use is direct and is little-affected by other types of aircraft activity. The measurement of these changes is relatively straightforward once the nature of the change has been identified. The main problems are those of impact identification, that is, being able to anticipate potential changes and to recognize unexpected changes once they actually occur.

Although the above model does not provide a step by step procedure for environmental analyses, it hopefully does provide a sound basis for understanding the sequencing and source of impacts, the focus of the assessment effort, and the major types of potential environmental impacts. The classifications shown in Figure 5 are applicable to all stages of the environmental analysis process. Thus, they can be used to make rapid initial determinations in the "environmental assessment" or "environmental review" stages as well as more detailed and comprehensive analyses in the "environmental impact statement" stage. The main advantage of the model is to help guide the analysis through what could otherwise be a confusing jumble of causation, impact linkages, and environmental changes.

Chapter 4

CONCLUSIONS

Current Trends

In Chapter 1, the technological obstacles preventing a wider use of the helicopter for commercial passenger operations were discussed. Chapter 2 outlined the current regulatory and research involvement of federal agencies in helicopter operations and indicated the types of environmental analyses required for such involvement. Since existing methods of environmental analyses are not well formulated, Chapter 3 set out the bases for developing a model of environmental assessment that clearly distinguishes between the helicopter system, the users of the system, and the public at large. This final chapter will attempt to forecast the effects of technological development upon environmental analysis methodologies in the near future.

All evidence indicates that successful commercial development of helicopter passenger services will be based upon economics and not merely upon government regulation or technological breakthrough. Those changes in regulatory policy or helicopter technology which generate a market for passenger services will ensure that the environmental issues also will receive attention. As the helicopter becomes more widely used, two trends are likely to occur. The first is that there will be greater pressure for user preferences to be integrated into subsequent development plans. The second is that wider public exposure to and experience with helicopters will more clearly define the problems of community acceptance. Effective solutions to the problems of these two trends will be found only when they become an economic necessity. This will occur when helicopters attain widespread use or are on the verge of such use. At that point, environmental analyses of helicopters will become a matter of public policy. However, the methods of environmental analysis applicable to helicopters are still in their infancy, and especially so within the federal agencies concerned with helicopter regulation or development. Neither the FAA nor the CAB has had experience in assessing helicopter passenger services as part of their regulatory responsibilities. In addition, NASA has not yet developed specific criteria for analyzing the impacts of its research and development activities on helicopters.

Since the CAB and the FAA are not likely to undertake comprehensive environmental analyses before a more technologically-advanced helicopter is developed and commercially deployed, the research and development program of NASA is the logical place to initiate the environmental

analysis of helicopter impacts. Some analysis has already begun in terms of research into noise and energy efficiency. However, the current level and coordination of research within NASA can hardly be termed "a detailed statement", "interdisciplinary", or "an evaluation of meaningful alternatives", nor is the current research integrated within the process of interagency review, CEQ overview, and public hearings. In short, current research is still at the level of basic technological investigations and not at the level of public policy studies. It is essential that the former be the basis of the latter, that is, public policy analysis must be firmly grounded in scientific studies. However, public policy must go beyond science and technology into the economic, social, and political realms. These are precisely the areas in which helicopter-oriented research is lacking at present.

Urgent Environmental Research Needs

There are several key areas of research that need to be addressed if helicopter passenger services are to be successfully expanded. These areas incorporate a mix of environmental, economic, and public policy considerations that cannot be easily separated. Being the research-oriented agency, NASA has the prime responsibility for undertaking these studies, although some of the demand and market studies might be carried out by the FAA or the CAB.

1. Given that there are "no reliable methods" for predicting community noise impacts, studies should be done of community response to existing helicopter flights. This would involve less acoustic investigation and more sociological investigation. The studies should be designed to test the attitudes of both control groups and groups exposed to known levels and frequencies of noise.

2. A more precise means of estimating demand for helicopter passenger services among upper middle and middle income groups is needed. One potentially fruitful approach is the willingness-to-pay method frequently used in estimating future recreation markets (4). The method involves asking people who use other modes of transportation how much more they would be willing to pay to take the less time-consuming helicopter mode. By carefully selecting different modes, distances, and time savings, a more accurate picture of demand can be obtained. Similarly, the willingness-to-pay method can be used to estimate the costs of rider discomfort. Whether the costs are viewed in monetary terms or levels of demand, the relevant questions include how much more helicopter passengers are willing to pay to reduce noise to the level of a jet plane or a train, how much should the fare be reduced to compensate for existing discomfort, and what is the effect of short versus long distances on passenger willingness-to-pay?

3. Methods for determining the market potential of cities for helicopter passenger services are urgently needed. Such methods could include city size, population characteristics, air travel demands, and distances to other cities as primary variables. Population gravity models may be useful for this purpose (3). Another approach is found in a recent study by Dajani et al (9) who developed an intraurban helicopter cost model having the capability of selecting an efficient helicopter network for a given city in terms of service characteristics and operating costs. The major inputs into the model are flight times, flight distances, headways, capacity, average fares, average load factors, and potential air travellers. The key outputs from the model are system cost, cost per seat mile, fare per seat, fare per passenger, and break-even passenger volume. Models of this general type are important for identifying urban areas having a high potential for new or expanded helicopter networks.

4. The experience of local, area and state agencies in regulating existing helicopter services should be evaluated. For example, a cursory review of New York Airways readily shows an almost total lack of any systematic or scientific approach to helicopter regulation on the part of the state and federal agencies. The New York City Department of Noise Abatement denies any interest in or responsibility for helicopter operations (27), while the New York-New Jersey Port Authority simply has no official policy concerning helicopters, even though it rents landing spaces at area airports (24). On the other hand, the New York City Department of Marine and Aviation reviews applications and grants helicopter landing permits on a "case-by-case basis" (22). The federal agencies in the area have provided no better regulatory models, since neither the FAA nor the CAB has actively followed the progress of helicopter operations in the city (23,25). New York Airways itself reports its operations are relatively free of outside control (26). Studies of this nature will serve to highlight the need for a coordinated regulatory policy towards helicopters.

5. There is yet a broader aspect of urban airspace of importance to city planning which is still unresolved. While the Federal Government has established its control over airspace for air transportation and electromagnetic communications, the operational and spatial limits of this control have not been clearly defined. In its broadest interpretation, the term "airspace" could be defined as the region beginning with ground surfaces and the tops of existing structures and extending upwards indefinitely. If this interpretation is used, the Federal Government could legally shape the height and form of all new buildings and other structures in a city. Such control could lead to federal constraints on urban development, complete federal control over aviation traffic, and even intolerable air pollution through increased air traffic volumes. Although the Federal Government is not

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likely to claim such extreme control over urban airspace, the possibility of its evolving gradually exists as long as the different federal, state, and local jurisdictions remain so unclear. A city can accept only so much federal influence over its airspace without losing control over one of its own spatial dimensions. There is a great difference between complete federal control over all aspects of airspace and only limited federal control over airways, communication frequencies, and air quality standards with the remaining issues of airspace left to state and local jurisdictions.

According to Branch (1), there are both private and public regions in urban airspace. Private airspace is a function of private property rights, while public airspace is a function of air operational safety and other public purposes. Property rights and private airspace are limited by the public need for zoning laws and building codes, but in return, property owners are entitled to "buffer" airspace above and between buildings for light, air, and physical separation. In Branch's view, the growth of urban air traffic may result in both private and public demands for airspace rights for helicopter operations. This could lead to public demand for rooftop helistops on privately-owned buildings as well as for greater protection from aerial noise pollution and from hazards of helicopter flights. Thus, private and public rights to airspace are interdependent, but the unlimited extension of public rights will progressively eliminate private prerogatives (1).

At present, the issue is complicated by the natural reluctance of the Federal Government to claim total jurisdiction over urban airspace down to all roof, wall, and ground surfaces or to clarify the limits of its control. Total federal control of urban airspace would be administratively disastrous for the regulatory agencies and would eventually lead to major political confrontations. Because some federal officials fear that clarifying the issues could threaten existing federal sovereignty, the matter is likely to be left in limbo until some crisis demands clarification and forces a resolution. This situation is replete with potential problems for future urban development. However, conflict need not arise, for carefully formulated policies and legislation can be developed designating the respective rights and responsibilities appropriate to federal and local governments (1). What is needed is greater recognition of the poorly-defined issue of urban airspace control and a greater willingness on the part of federal, state, and local regulatory agencies to resolve the questions of jurisdictional limits.

6. From the standpoint of environmental analysis, there is great need for a basic model integrating the research, development, and

operational aspects of helicopter passenger services. This model should form the basis on which the CAB, FAA, NASA, and other regulatory agencies can develop their own specific environmental assessment methods. It would be expected, for example, that the CAB would stress the environmental aspects of flight routes and networks, that the FAA would emphasize the environmental impacts of airport design and air safety, and that NASA would be concerned with the research aspects of helicopter systems design. By using a common analytic model, however, all of these agencies could readily utilize the environmental findings of any one of them.

In addition to the above, a basic environmental model can serve to focus attention on the key issues impeding helicopter development, and thereby lead to a broader-based effort at overcoming the problems. The environmental assessment model presented at the end of Chapter 3 is an initial attempt to formulate this common analytic base. To develop it further, additional investigation is needed to expand and incorporate the environmental responsibilities of the CAB, FAA, and NASA within the model. Until such a basic model is formulated and accepted, future environmental analyses of helicopter services are likely to remain restricted in scope, agency-specific, and of limited use to other organizations.

7. A final issue of importance is the need to compare helicopter passenger services with other alternative modes of transportation. The purpose of such a comparison should be to place helicopter services in perspective and to determine the areas of helicopter development requiring the most attention. The study could begin with the identification of both current and future alternative transportation technologies, such as personal autos, buses, high speed rail, etc. A second step would include an intermodal comparison of the general aspects of cost, rider comfort, speed, safety, and associated environmental impacts. And finally, the third step should determine which aspects of helicopter systems are competitively the weakest and then suggest how these weaknesses might be overcome. In short, the case for expanded helicopter passenger services can be significantly improved through a thorough understanding of not only helicopter systems but also of all relevant alternative modes of transportation.

The Role of NASA in Environmental Research

There is no question but that a major impetus for wider commercial application of helicopters will result from current research and development supported by the Federal Government. As the lead research-oriented agency, NASA must take the initiative to analyze the broad impacts of helicopter systems and services. When research and development finally produces a helicopter capable of generating a passenger market, the FAA will be required to review the airworthiness of the

aircraft and investigate its potential community impacts. Similarly, the CAB will be responsible for the determination of routes, fares, schedules, and related environmental problems. However, neither the CAB nor the FAA will become heavily involved until research conducted by NASA has produced a market-generating helicopter.

Because of its research mandate, NASA is the logical federal agency to undertake serious investigations into the problems of analyzing the environmental impacts of helicopters. In preparation for this effort, NASA should broaden its current research activities to include the social, political, and economic considerations required in environmental impact statements. Such an approach to research would encompass sociological investigations of community noise impacts, investigations of the potential demand for helicopter services among middle and upper-middle income groups, investigations of methods for determining the market potential of cities for helicopter services, studies of the impact of helicopters on local planning and regulation, and finally a comparison of alternative transportation modes to helicopters. At present, NASA is the only federal agency with the authority and overall resources to carry out a coordinated program of research investigations into the above issues. As this report has pointed out, the general area of environmental analysis of helicopter systems is poorly-developed, the potential environmental impacts of helicopter operations on the general public are considerable, and the need for a lead federal agency is clearly evident.

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Appendix A

TITLE I OF NATIONAL ENVIRONMENTAL POLICY ACT OF
1969, P.L. 91-190 (83 STAT. 852), JANUARY 1, 1970

An Act

83 STAT. 852

To establish a national policy for the environment, to provide for the establishment of a Council on Environmental Quality, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Environmental Policy Act of 1969".

National Environmental
Policy Act of
1969.

PURPOSE

SEC. 2. The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation, and to establish a Council on Environmental Quality.

TITLE I

DECLARATION OF NATIONAL ENVIRONMENTAL POLICY

SEC. 101. (a) The Congress, recognizing the profound impact of man's activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of man, declares that it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.

(b) In order to carry out the policy set forth in this Act, it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may—

- (1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- (2) assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- (3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
- (4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;
- (5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and

Appendix A. NEPA (cont.)

83 STAT. 853

(6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

(c) The Congress recognizes that each person should enjoy a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment.

Administration.

SEC. 102. The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall—

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—

- (i) the environmental impact of the proposed action,
- (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
- (iii) alternatives to the proposed action,
- (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
- (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Copies of statements, etc., availability.

81 Stat. 54.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality, and to the public as provided by section 552 of title 5, United States Code, and shall accompany the proposal through the existing agency review processes;

(D) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

(E) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;

(F) make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;

(G) initiate and utilize ecological information in the planning and development of resource-oriented projects; and

(H) assist the Council on Environmental Quality established by title II of this Act

SEC. 103. All agencies of the Federal Government shall review Review. their present statutory authority, administrative regulations, and current policies and procedures for the purpose of determining whether there are any deficiencies or inconsistencies therein which prohibit full compliance with the purposes and provisions of this Act and shall propose to the President not later than July 1, 1971, such measures as may be necessary to bring their authority and policies into conformity with the intent, purposes, and procedures set forth in this Act.

SEC. 104. Nothing in Section 102 or 103 shall in any way affect the specific statutory obligations of any Federal agency (1) to comply with criteria or standards of environmental quality, (2) to coordinate or consult with any other Federal or State agency, or (3) to act, or refrain from acting contingent upon the recommendations or certification of any other Federal or State agency.

SEC. 105. The policies and goals set forth in this Act are supplementary to those set forth in existing authorizations of Federal agencies.

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EXCERPTS FROM COUNCIL ON ENVIRONMENTAL QUALITY, "PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS: GUIDELINES" (40 CFR 1500), FEDERAL REGISTER, AUGUST 1, 1973, pp. 20553-4.

§ 1500.8 Content of environmental statements.

(a) The following points are to be covered:

(1) A description of the proposed action, a statement of its purposes, and a description of the environment affected, including information, summary technical data, and maps and diagrams where relevant, adequate to permit an assessment of potential environmental impact by commenting agencies and the public. Highly technical and specialized analyses and data should be avoided in the body of the draft impact statement. Such materials should be attached as appendices or footnoted with adequate bibliographic references. The statement should also succinctly describe the environment of the area affected as it exists prior to a proposed action, including other Federal activities in the area affected by the proposed action which are related to the proposed action. The interrelationships and cumulative environmental impacts of the proposed action and other related Federal projects shall be presented in the statement. The amount of detail provided in such descriptions should be commensurate with the extent and expected impact of the action, and with the amount of information required at the particular level of decisionmaking (planning, feasibility, design, etc.). In order to ensure accurate descriptions and environmental assessments, site visits should be made where feasible. Agencies should also take care to identify, as appropriate, population and growth characteristics of the affected area and any population and growth assumptions used to justify the project or program or to determine secondary population and growth impacts resulting from the proposed action and its alternatives (see paragraph (a)(1)(3)(ii), of this section). In discussing these population aspects, agencies should give consideration to using the rates of growth in the region of the project contained in the projection compiled for the Water Resources Council by the Bureau of Economic Analysis of the Department of Commerce and the Economic Research Service of the Department of Agriculture (the "OBERS" projection). In any event it is essential that the sources of data used to identify, quantify or evaluate any and all environmental consequences be expressly noted.

(2) The relationship of the proposed action to land use plans, policies, and controls for the affected area. This requires a discussion of how the proposed action may conform or conflict with the objectives and specific terms of approved or proposed Federal, State, and local

land use plans, policies, and controls, if any, for the area affected including those developed in response to the Clean Air Act or the Federal Water Pollution Control Act Amendments of 1972. Where a conflict or inconsistency exists, the statement should describe the extent to which the agency has reconciled its proposed action with the plan, policy or control, and the reasons why the agency has decided to proceed notwithstanding the absence of full reconciliation.

(3) The probable impact of the proposed action on the environment.

(i) This requires agencies to assess the positive and negative effects of the proposed action as it affects both the national and international environment. The attention given to different environmental factors will vary according to the nature, scale, and location of proposed actions. Among factors to consider should be the potential effect of the action on such aspects of the environment as those listed in Appendix II of these guidelines. Primary attention should be given in the statement to discussing those factors most evidently impacted by the proposed action.

(ii) Secondary or indirect, as well as primary or direct, consequences for the environment should be included in the analysis. Many major Federal actions, in particular those that involve the construction or licensing of infrastructure investments (e.g., highways, airports, sewer systems, water resource projects, etc.), stimulate or induce secondary effects in the form of associated investments and changed patterns of social and economic activities. Such secondary effects, through their impacts on existing community facilities and activities, through inducing new facilities and activities, or through changes in natural conditions, may often be even more substantial than the primary effects of the original action itself. For example, the effects of the proposed action on population and growth may be among the more significant secondary effects. Such population and growth impacts should be estimated if expected to be significant (using data identified as indicated in § 1500.8(a)(1)) and an assessment made of the effect of any possible change in population patterns or growth upon the resource base, including land use, water, and public services, of the area in question.

(4) Alternatives to the proposed action, including, where relevant, those not within the existing authority of the responsible agency. (Section 102(2)(D) of the Act requires the responsible agency to "study, develop, and describe appro-

priate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources"). A rigorous exploration and objective evaluation of the environmental impacts of all reasonable alternative actions, particularly those that might enhance environmental quality or avoid some or all of the adverse environmental effects, is essential. Sufficient analysis of such alternatives and their environmental benefits, costs and risks should accompany the proposed action through the agency review process in order not to foreclose prematurely options which might enhance environmental quality or have less detrimental effects. Examples of such alternatives include: the alternative of taking no action or of postponing action pending further study; alternatives requiring actions of a significantly different nature which would provide similar benefits with different environmental impacts (e.g., nonstructural alternatives to flood control programs, or mass transit alternatives to highway construction); alternatives related to different designs or details of the proposed action which would present different environmental impacts (e.g., cooling ponds vs. cooling towers for a power plant or alternatives that will significantly conserve energy); alternative measures to provide for compensation of fish and wildlife losses, including the acquisition of land, waters, and interests therein. In each case, the analysis should be sufficiently detailed to reveal the agency's comparative evaluation of the environmental benefits, costs and risks of the proposed action and each reasonable alternative. Where an existing impact statement already contains such an analysis, its treatment of alternatives may be incorporated provided that such treatment is current and relevant to the precise purpose of the proposed action.

(5) Any probable adverse environmental effects which cannot be avoided (such as water or air pollution, undesirable land use patterns, damage to life systems, urban congestion, threats to health or other consequences adverse to the environmental goals set out in section 101 (b) of the Act). This should be a brief section summarizing in one place those effects discussed in paragraph (a)(3) of this section that are adverse and unavoidable under the proposed action. Included for purposes of contrast should be a clear statement of how other avoidable adverse effects discussed in paragraph (a)(2) of this section will be mitigated.

(6) The relationship between local short-term uses of man's environment

Appendix B. CEQ Guidelines (cont.)

and the maintenance and enhancement of long-term productivity. This section should contain a brief discussion of the extent to which the proposed action involves tradeoffs between short-term environmental gains at the expense of long-term losses, or vice versa, and a discussion of the extent to which the proposed action forecloses future options. In this context short-term and long-term do not refer to any fixed time periods, but should be viewed in terms of the environmentally significant consequences of the proposed action.

(7) Any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented. This requires the agency to identify from its survey of unavoidable impacts in paragraph (a)(5) of this section the extent to which the action irreversibly curtails the range of potential uses of the environment. Agencies should avoid construing the term "resources" to mean only the labor and materials devoted to an action. "Resources" also means the natural and cultural resources committed to loss or destruction by the action.

(8) An indication of what other interests and considerations of Federal policy are thought to offset the adverse environmental effects of the proposed action identified pursuant to paragraphs (a)(3) and (5) of this section. The statement should also indicate the extent to which these stated countervailing benefits could be realized by following reasonable alternatives to the proposed action (as identified in paragraph (a)(4) of this section) that would avoid some or all of the adverse environmental effects. In this connection, agencies that prepare cost-benefit analyses of proposed actions should attach such analyses, or summaries thereof, to the environmental impact statement, and should clearly indicate the extent to which environmental costs have not been reflected in such analyses.

(b) In developing the above points agencies should make every effort to convey the required information succinctly in a form easily understood, both by members of the public and by public decisionmakers, giving attention to the substance of the information conveyed rather than to the particular form, or length, or detail of the statement. Each of the above points, for example, need

not always occupy a distinct section of the statement if it is otherwise adequately covered in discussing the impact of the proposed action and its alternatives—which items should normally be the focus of the statement. Draft statements should indicate at appropriate points in the text any underlying studies, reports, and other information obtained and considered by the agency in preparing the statement including any cost-benefit analyses prepared by the agency, and reports of consulting agencies under the Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq., and the National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq., where such consultation has taken place. In the case of documents not likely to be easily accessible (such as internal studies or reports), the agency should indicate how such information may be obtained. If such information is attached to the statement, care should be taken to ensure that the statement remains an essentially self-contained instrument, capable of being understood by the reader without the need for undue cross reference.

(c) Each environmental statement should be prepared in accordance with the precept in section 102(2)(A) of the Act that all agencies of the Federal Government "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decisionmaking which may have an impact on man's environment." Agencies should attempt to have relevant disciplines represented on their own staffs; where this is not feasible they should make appropriate use of relevant Federal, State, and local agencies or the professional services of universities and outside consultants. The interdisciplinary approach should not be limited to the preparation of the environmental impact statement, but should also be used in the early planning stages of the proposed action. Early application of such an approach should help assure a systematic evaluation of reasonable alternative courses of action and their potential social, economic, and environmental consequences.

(d) Appendix I prescribes the form of the summary sheet which should accompany each draft and final environmental statement.

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EXCERPTS FROM CIVIL AERONAUTICS BOARD PART 312,
 "IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT,
 INCLUDING THE PREPARATION OF ENVIRONMENTAL STATEMENTS,"
 WASHINGTON, D.C., AUGUST 1975

SUBPART E - ENVIRONMENTAL PROCEDURES

§312.11 General.

The purpose of environmental review procedures established by these regulations is to determine whether a proposed Board action is a major Federal action significantly affecting the quality of the human environment.

§312.12 Filing of environmental evaluations by applicants.

(a) Except where a waiver or exemption has been granted under section 312.6, every person filing an application falling within the scope of section 312.9(a)(1) shall attach to such application an environmental evaluation, as provided in subsection (c).

(b) Except where a waiver or exemption has been granted under section 312.6, every person filing an application falling within the scope of section 312.9(a)(2) shall include in such application a representation of whether or not the application, if granted, would have any of the results set forth in sections 312.9(a)(2)(i), (ii), (iii), (iv), or (v), along with an explanation. If grant of such application would produce any of those results, the applicant shall attach to such application an environmental evaluation, as provided in subsection (c).

(c) An environmental evaluation shall contain:

(1) A description of the existing service affected by the application and of the proposed service, should the application be granted, to include:

(i) The number of existing flights and the number of flights which would be increased or decreased in each specified market;

(ii) The time of arrival and departure of the flights; 2/

(iii) The type of aircraft used or proposed to be used; '

(iv) The block hours per flight; and

(v) The projected use of any aircraft to be released by the proposed action.

(2) A profile of the airport(s) used or proposed to be used, to include:

(i) Average daily scheduled air carrier operations, by aircraft type, peak season and off-peak season;

(ii) Ratio of day/night operations;

(iii) Percent of 4-engine low-bypass-ratio operations;

(iv) Percent of short-range (less than 1000 miles) operations, and

(v) Overall acreage of the airport(s).

2/ At a minimum, it shall be indicated whether the times of departure and arrival are during the day (0700-2200 hours) or the night (2200-0700 hours), and during peak or off-peak hours, for each affected airport.

Appendix C. CAB Part 132 (cont.)

(3) A description of any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented, including but not limited to any additional fuel usage.

(4) A forecast of the net number of additional annual passengers expected to be carried if the proposed action is implemented.

(5) The Noise Screening Test and Pollutants Screening Test, set forth in Appendix I hereto.

§312.13 Initial determination with respect to environmental impact.

After any application is filed and appropriate responses have been made the responsible official, after consideration of such filings and other available data, 3/ shall make an initial determination with respect to environmental impact. For applications which must be accompanied by an environmental evaluation, or when directed by order of the Board, or when environmental objections or comments have been filed in response to an application, or otherwise at the discretion of the responsible official, he shall proceed as follows:

(a) Environmental rejection. If he finds that the Federal action contemplated is not "major" in character, within the meaning of NEPA, or that the resulting environmental consequences are inconsequential, frivolous or not cognizable under law, he shall send a summary letter to the party raising the objection or, if there is none, issue a summary notice stating his finding. A summary notice may encompass several unrelated applications. The letter or notice shall be termed an environmental rejection.

(b) Environmental negative declaration. If the responsible official finds that although an environmental rejection is not called for, nevertheless an environmental impact statement is not necessary, he shall prepare an environmental negative declaration stating those facts and the reasons for reaching such conclusions. The declaration shall also set forth a description of the proposed action and a summary description of its probable environmental impacts. In addition, if it has been identified in §312.9 as an action normally having a potential effect on the environment, or it is similar to actions for which a significant number of environmental impact statements have been prepared, or if the action has previously been included in the list of proceedings for which environmental impact statements are being prepared, or if the proposed action has been the subject of a request by CEQ for the preparation of an environmental impact statement, the negative declaration shall discuss and explain the applicable circumstances.

(c) Environmental impact statements. If the responsible official believes that the proposed action may reasonably be expected to result in a major Federal action significantly affecting the quality of the human environment based on the standards of §§312.9 and 312.10 he shall notify the parties, the public (through appropriate news releases, notice in the Federal Register and inclusion on a list in the Public Reference Room), and the EPA and CEQ (through the periodic submission of lists), that an environmental impact statement will be prepared in the particular matter.

§312.14 Preparation of environmental impact statements.

(a) General. Upon a determination that a proposed action may have a significant effect upon the environment, the staff will undertake to prepare an environmental impact statement. The impact statement is normally comprised of two stages: draft and final. The draft statement must satisfy to the fullest extent possible, at the time the draft is prepared, the requirements established for final statements by section 102(2)(C) of NEPA. Each draft and final environmental statement will be accompanied by a summary sheet in the form set forth in Appendix II. An environmental impact statement shall be prepared early enough to be part of the decision-making process on the proposed action to which it relates.

3/ The responsible official may request, pursuant to section 312.14(b), such additional relevant and material data from the applicants or others as he deems necessary for his initial determination, and all such persons shall comply therewith.

Appendix C. CAB Part 132 (cont.)

(b) Environmental assessments. Prior to the preparation of a draft environmental impact statement, negative declaration or rejection, an applicant or other person may be required to supply additional information in the form of an environmental assessment, or an environmental evaluation if none was previously filed. The environmental assessment will contain such relevant and material information as the responsible official shall deem necessary and will contain sufficient information to enable the responsible official to begin preparation of a draft environmental impact statement. After receipt of an environmental assessment, the responsible official may revise his judgment that an impact statement is required and, in lieu thereof, may prepare an environmental negative declaration. In such circumstances, the responsible official may conclude nevertheless that the unusual complexity or controversial nature of the case requires that the negative declaration should be circulated for comment as would an environmental impact statement.

(c) Draft environmental impact statements. In preparing draft environmental impact statements the staff shall take into account the guidelines set forth in 40 C.F.R. 1500.7-1500.8 (39 F.R. 20552-3). Draft statements shall set forth in detail: (1) the environmental impact of the proposed or contemplated action; (2) any adverse environmental effects which cannot be avoided should the proposed or contemplated action be implemented; (3) alternatives to the proposed or contemplated action; (4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and (5) any irreversible and irretrievable commitments of resources which would be involved in the proposed or contemplated action should it be implemented.

In some cases draft environmental impact statements may be prepared by private consultants. In all cases the Board will make its own evaluation of the environmental issues and take responsibility for the scope and content of draft and final environmental impact statements.

(f) Final environmental impact statements. After receipt of comments on the draft statement, the staff will prepare a final environmental impact statement in accordance with the requirements for draft statements. To the extent that opposing professional views and responsible opinion on the environmental effects of the proposed or contemplated action have not been discussed in the draft statement and are brought to attention through the commenting process, the environmental effect of the action will be reviewed in the light of those comments. In such case, meaningful reference will be made in the final statement to the existence of any responsible opposing view not discussed in the draft statement, indicating the response to the issues raised. All substantive comments received on the draft statement (or summaries thereof where response has been exceptionally voluminous) will be attached to the final statement, whether or not each such comment is thought to merit individual discussion in the text of the statement. The final statement may incorporate the draft statement by reference, in whole or in part. The final statement will be filed and distributed in the same manner as specified for draft statements to those who submitted substantive comments on the draft statement, except that in any case the final statement will be distributed to CEQ, the Environmental Protection Agency, the Administrative Law Judge and any parties to a proceeding, and any person requesting a copy, subject to \$312.20. The final impact statement and any substantive comments received on the draft statement will be considered in the Board's review and decision-making processes.

EXCERPTS FROM FEDERAL AVIATION ADMINISTRATION, "POLICIES AND PROCEDURES FOR CONSIDERING ENVIRONMENTAL IMPACTS" (FAA ORDER 1050.1B), FEDERAL REGISTER, AUGUST 12, 1976, PP. 34225-34230.

3. Definitions applicable to this order

a. *Major Federal Action Significantly Affecting the Quality of the Human Environment* includes any Federal action falling within the scope of paragraph 301 of this Order. These actions require the preparation of an EIS.

b. *Environmental Impact Assessment Report* refers to a report prepared outside FAA, which analyzes the environmental impact of a proposed action. The report may serve as the basis, in whole or in part, for the FAA's draft environmental impact statement (hereafter DEIS) or ND.

c. *Preliminary environmental review* is a pre-EIS or pre-ND look at environmental impacts of proposed actions and services to alert program officers of the action's possible significant impacts on the quality of the human environment or of impacts which may be highly controversial on environmental grounds.

d. *Draft Environmental Impact Statement* is the document that reflects FAA's initial evaluation of the environmental impact of a proposed action. The agency makes its own evaluation and assumes responsibility for the DEIS. It is distributed by FAA to the Council on Environmental Quality (hereafter CEQ) and other appropriate Federal, State and local agencies for comment and is made available to the public.

e. *Final Environmental Impact Statement* (hereafter FEIS) is the document that reflects FAA's final evaluation of the environmental impact of a proposed action. The EIS is the vehicle for considering the environmental impacts of a proposed Federal action. The EIS shall accompany the proposed action through the Federal decision-making process.

f. *Negative Declaration* represents a determination by the responsible official that a particular action is not one significantly affecting the quality of the human environment and that coordination and review pursuant to Section 102(2)(C) of NEPA is not required. Except for differences in complexity and scope, the documentation supporting a ND is similar to that supporting an EIS.

g. *Prior Action Affirmation* is a finding that a proposed action is within the scope of a previously approved EIS or ND, that preparation of a new EIS or ND is not necessary, and, therefore, that the prior Federal action may be affirmed.

h. *Human Environment* includes the aggregate of all external conditions and influences (ecological, biological, economic, social, cultural, historical, aesthetic, etc.) that affect the life of a human.

i. *Responsible Official* is the official who makes the final determination as to whether the environmental requirements for a proposed agency action have been satisfied and who approves the EIS or ND.

j. *Program Officer(s)* are the agency officers assigned by the responsible official, to undertake preliminary environmental reviews and to prepare environmental assessments, EISs, or NDs.

k. *Noise Sensitive Areas* may include residential neighborhoods, educational health, and religious structures and sites, and outdoor recreation, cultural, and historic sites. A noise sensitive area is one where noise may interfere with the usual activities associated with use of the land. Whether sound interferes with a particular use depends upon the level of noise exposure received and the type of activities involved. A site which is unacceptable for a particular use outside of a structure may be acceptable for the same activity when it is located inside a structure which has adequate noise attenuation features.

4. *SCOPE*. Except as provided below, the requirements in this order apply to, but are not limited to, the following: all grants, loans, contracts, leases, construction, research activities, rulemaking and regulatory actions, certifications, licensing, permits, plans submitted to the agency by State or local agencies which require FAA approval, and legislation proposed by FAA.

a. *Class action or program statement*. A general class of actions or a program may be covered by a single EIS or ND when the environmental impacts of all actions in the class or program, alternatives thereto, and measures to mitigate adverse environmental impacts are substantially similar.

b. *Exceptions to the Requirement for an EIS or ND*:

(1) Assistance in the form of general revenue sharing with no FAA control over the subsequent use of the funds;

(2) Administrative and operating procurements (e.g., general supplies and replacement parts and equipment including contracts for professional services);

(3) Personnel actions (e.g., promotions, hirings);

(4) Planning grants which do not imply a project commitment;

(5) Project amendments (e.g., increases in costs) which do not alter the environmental impact of the action;

(6) Legislative proposals not originating in FAA;

(7) Policy and planning documents not intended for or which do not cause direct implementation of project or system actions;

(8) Agreements with foreign governments, international organizations, or U.S. Government departments calling for the provision of technical assistance, advice or services in foreign countries;

(9) Organizational changes within the FAA;

(10) Emergency measures regarding the air or ground safety;

(11) The development and implementation of job related training programs;

(12) The planning and development of projects and programs leading to Aeromedical Applications and Standards; personnel efficiency and performance;

(13) The approval or issuance of certificates covering medicals, airmen, delegated authority, ground schools; out-of-agency training; and aircraft repair-maintenance not affecting noise, emissions or wastes;

(14) In addition to the exceptions noted above, each of the Service Appendices may provide for exceptions of specific types of projects or categories of actions carried out by that Service, providing that these excepted actions are not major Federal actions significantly affecting the quality of the human environment.

c. *Actions accepted from this Order* or for which class EISs or NDs have been filed do not require further documentation.

d. *An action* which has been excepted in this order or for which a class EIS or ND has been filed, but which in a particular case significantly affects the quality of the human environment requires the preparation of an EIS.

5. *Affirming prior actions*. The preparation of a new EIS or ND is not necessary when it can be documented that: the proposed action conforms to plans or projects for which a prior EIS or ND has been filed, the data and analyses contained in the previous EIS or ND are still substantially valid, and that all pertinent conditions and requirements of the prior approval have or will be met in the current action. In this case, no additional assessment or coordination is required by this order, and the responsible official may affirm the prior action subject to review for legal sufficiency.

6. *Changes to this directive*. The Director, Office of Environmental Quality (hereafter AEQ-1) is responsible for and may make changes in Chapters 1-4 of this directive, and each office or service director may make changes in his respective appendix, subject to AEQ-1 and Office of the Chief Counsel (hereafter AGC) coordination provided:

a. The change does not affect policy, delegations of authority, or assignment of responsibilities outside the service's authority;

b. The Administrator has not specifically reserved authority to make the change;

c. Substantial changes obtain the concurrence of the Office of the Assistant Secretary for Environment, Safety and Consumer Affairs (hereafter TES) and the Office of the General Counsel (hereafter TGC) and are published for comment in the FEDERAL REGISTER.

7. *Responsibilities*. Agency officials are responsible for implementing this order as follows:

a. *Compliance* with the policies and procedures of this order is the responsibility of:

(1) The regional directors for all actions originating in the regions;

(2) The headquarters office and service directors for all actions originating at headquarters, and

(3) The center directors for all actions originating at centers.

b. *Service directors* are responsible, in addition, for:

(1) Revising their appendixes of this order, as appropriate;

(2) Providing supplemental guidelines for implementing this order in their program areas, as appropriate; and

(3) Consulting with and advising responsible officials on matters within their operational areas.

c. *Regional Directors* are responsible, in addition, for developing programs for:

(1) Assigning personnel and other resources necessary to assess and document all relevant environmental factors;

(2) Preparing and filing EISs and NDs as appropriate; and

(3) Assuring appropriate internal coordination of actions that cross program lines.

d. *Office of Environmental Quality* (hereafter AEQ) is responsible for:

(1) Overseeing FAA's environmental policies and procedures;

(2) Developing and coordinating policies and procedures under this order;

(3) Assisting services in developing guidance for their program areas;

(4) Consulting with and advising responsible officials in their implementation of this order; and

(5) Developing training programs in cooperation with the Office of Personnel and Training and the services.

e. *The Chief Counsel* and regional and center counsels provide legal counsel to all elements of FAA regarding the legal sufficiency of environmental documents.

f. *Other responsibilities* regarding specific program areas are set forth in Appendices 1-6 of this order.

8-199. *Reserved*.

CHAPTER 2. PRELIMINARY CONSIDERATIONS AND PROCEDURES

SECTION 1. PRELIMINARY ENVIRONMENTAL REVIEW

200. *Planning and development stage*. The environmental impacts of proposed actions shall be assessed and considered concurrently with initial planning, development, or site considerations.

201. *Initial review*. Preliminary environmental review shall indicate whether the proposed project could significantly affect the environment with respect to noise, land,

Appendix D. FAA Procedures (cont.)

air, and water quality, and is located in wetlands, coastal zones, or historic or archaeological sites; or areas inhabited by endangered species, or areas protected under DOT Section 4(f); and whether the action would be highly controversial on environmental grounds. Documentation is not required except as necessary to alert program officers to foreseeable environmental impacts and controversies at the earliest stages of consideration.

a. Preliminary review should include a visit to the site. This visit should be made concurrently with any other preliminary on-site visit(s).

b. Secondary sources should also be used, including:

(1) Maps and aerial photos, such as those available from U.S. Coast and Geodetic Survey, local land use planners and transportation and engineering agencies;

(2) Interviews with land use planners, engineers and local experts in forestry, fish and wildlife, agriculture, endangered species, historic preservation and archaeology;

(3) Reference sources, such as the National Register of Historic Places, and similar State or local listings.

202. *Budget stage* The Office of Budget is responsible for assuring appropriate environmental consideration and documentation at the budget stage. Criteria for environmental consideration in the facilities budget process are at Appendix 2, paragraph 7.

203. *Research*. Criteria for environmental consideration of research activities are in Appendix 1.

204.-205. *Reserved*

SECTION 2 PRELIMINARY CONSULTATION PROCEDURES

206. *Consultation* Affected local units of government, and pertinent Federal and State agencies (see Appendix 7) should be consulted early in the process of preparing a DEIS, ND, or environmental impact assessment report. Advice received early in project development could be helpful in preparing EISs or NDs. Input on the environmental impacts of the proposed action shall be considered, as appropriate, in determining whether the proposed action requires an EIS or ND and in preparing the DEIS or ND. This consultation with State and local agencies may be done through A-95 procedures.

207. *Citizen involvement* Citizen involvement should be initiated at the earliest practical time and continued throughout the development of the proposed project in order to obtain meaningful input. Examples of citizen groups are: environmental, conservation, public service, education, labor, business or aviation and airspace user organizations and citizen advisory committees.

a. *Methods of communication to be used include*

(1) Individual contacts, citizen advisory committees, telephone, and mail;

(2) Public hearings or meetings;

(3) Information for the public or through the media;

(4) Bulk mailings, advertisements or notices in local newspapers or public places; and

(5) Up-to-date mailing lists of special interest groups and other interested parties at the National, regional, and local levels.

b. *Comments from these individuals and groups* shall be considered in preparing an EIS or ND. A summary of citizen involvement and the environmental issues raised shall be documented in the EIS or ND.

c. *Citizen involvement* may be appropriate in defining the scope of work of an environmental impact assessment report developed by an applicant for aid or a consultant, or of a DEIS being developed by FAA.

208. *A-95 Review*. Notification of the proposed or planned action which has an impact on areawide or community development shall be submitted to appropriate state and areawide clearinghouses and normally through clearinghouses to designated public agencies, including those state and local agencies which are authorized to develop and enforce environmental standards. A-95 procedures should be helpful in alerting program officers and responsible officials to possible environmental controversies. Comments on the environmental effects of proposed actions are inputs to an EIS or ND, and shall be attached to the DEIS when it is circulated for review.

209. *Public hearing*.

a. The following elements are to be considered in deciding whether a public hearing or the opportunity for a public hearing is appropriate:

(1) The magnitude of the proposal in terms of environmental impact or controversy, economic costs, the size and location of the geographic area involved and the uniqueness or size of commitment of the resources involved;

(2) The degree of interest in the proposal, as evidenced by requests from the public and from Federal, State, and local authorities that a hearing be held;

(3) The complexity of the issue and the likelihood that information will be presented at the hearing which will be of assistance to the agency in fulfilling its responsibilities;

(4) The extent to which public involvement already has been achieved through other means, such as earlier public hearings, meetings with citizen representatives, and/or written comments on the proposed action, and

(5) When a public hearing is required by law.

b. The following shall be included in the notice for a public hearing or for the opportunity for a public hearing:

(1) A description of the proposed action;

(2) If a hearing is being held, the time, date, and place of the public hearing; and

(3) The availability and location of a DEIS, ND or environmental impact assessment report.

c. Notice of the hearing shall be in an areawide or local newspaper of general circulation.

d. A DEIS, ND, or environmental impact assessment report shall be available to the public 30 days prior to the public hearing.

e. The responsible official may assign program officers the responsibility for convening a hearing and serving as hearing officer.

210. *Notification of preparation of EIS*. Interested parties, including pertinent Federal, State, and local agencies shall receive early notification of an agency decision to prepare an EIS. This may be done by including notification of the decision to prepare an EIS with A-95 project notification and submitting them to Federal as well as state, regional, and local agencies or through other procedures. This shall include notice of the proposed action and solicit views on its impacts from any affected Federal land management entity or State clearinghouse (or other agency designated by the Governor).

211.-299. *Reserved*.

CHAPTER 3. ENVIRONMENTAL IMPACT STATEMENTS AND NEGATIVE DECLARATIONS

SECTION 1 DETERMINATION WHETHER AN ACTION IS A MAJOR FEDERAL ACTION SIGNIFICANTLY AFFECTING THE QUALITY OF THE HUMAN ENVIRONMENT

300. *Environmental assessment* Prior to undertaking an action which has not been excepted by this Order, all relevant environ-

mental factors shall be assessed (see paragraphs 324-343). If it is concluded that the proposed action is a major Federal action significantly affecting the quality of the human environment, the responsible official shall prepare and file an EIS. If it is concluded that the action is not a major Federal action significantly affecting the quality of the human environment, the responsible official shall prepare and file an ND.

301. *Actions requiring environmental impact statements*.

a. *An EIS* shall be prepared where an agency action:

(1) Has an effect that is not minimal on properties protected under Section 4(f) of the DOT act or Section 106 of the Historic Preservation Act;

(2) Is likely to be highly controversial on environmental grounds;

(3) Is likely to have a significant impact on natural, ecological, cultural, or scenic resources of National, State, or local significance, including endangered species or wetlands;

(4) Is likely to be highly controversial with respect to the availability of adequate relocation housing;

(5) Causes substantial division or disruption of an established community, or disrupts orderly, planned development, or is determined to be significantly inconsistent with plans or goals that have been adopted by the community in which the project is located;

(6) Causes a significant increase in surface traffic congestion;

(7) Has a significant impact on noise levels of noise sensitive areas;

(8) Has a significant impact on air quality or violates the Standards for air quality of the Environmental Protection Agency or an affected locality or state;

(9) Has a significant impact on water quality or may contaminate a public water supply system;

(10) Is inconsistent with any Federal, State or local law or administrative determination relating to the environment;

(11) Directly or indirectly affects human beings by creating a significant impact on the environment.

b. *In determining* whether a proposed Federal action requires an EIS, not only the overall, cumulative impact of the proposed action, but also the consequences of subsequent related actions must be considered.

(1) If the action would permit further contemplated actions, the impacts of both those actions and the proposed action must be considered in determining whether to prepare an EIS.

(2) If an EIS is required, it must be processed before making a commitment which would enable the future action to foreclose or narrow the consideration of alternatives or mitigating measures.

c. *A proposed action* is considered highly controversial when the action is opposed on environmental grounds by a Federal, State, or local government or by a substantial number of the persons affected by such action. A controversy over the amount of acquisition or relocation payments is not a controversy with respect to the availability of relocation housing.

302. *In case of doubt* as to whether an EIS is necessary for a particular action, the responsible official or program officer may consult with AEA and AGO.

303-304. *Reserved*.

SECTION 2 NEGATIVE DECLARATIONS

305. *Format*.

a. The ND may be a separate document, in which case it shall include a heading or statement identifying it as such, e.g.: De-

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partment of Transportation, Federal Aviation Administration, (Originating Region, Office, Service or Center) Negative Environmental Declaration (Subject of Declaration) (Date).

b. Or, the ND may be incorporated in other program documents.

c. The ND shall conclude that the action is not a major Federal action significantly affecting the quality of the human environment, and consequently, no environmental impact statement is required. Suggested language is:

The opinion of the undersigned, upon careful review of this proposed action, is that pertinent environmental factors have been assessed and adequately documented, and the action is not a major Federal action significantly affecting the quality of the human environment.

d. All NDs shall be dated and signed by the responsible official.

308. Scope of documentation

a. Depending on the complexity and degree of impact of a proposed action, a ND may range in content from a simple statement, supported with pertinent facts, that the action is not a major Federal action significantly affecting the quality of the human environment to an analysis involving the format and content necessary for environmental statements.

b. The ND shall include a brief description of the proposed action and its purpose.

c. The ND shall assess and document all relevant matters set forth in paragraphs 324 to 343 as necessary to support the conclusion that the action is not a major Federal action significantly affecting the quality of the human environment. It shall include any measures to minimize adverse impacts on the environment.

d. The ND shall identify and discuss the alternatives considered, particularly those which mitigate environmental impacts, including the alternative of no action.

e. The ND shall determine the proposed action's consistency or inconsistency with community planning, and shall document the basis for the determination.

f. If a ND includes a Section 4(f) determination, include the material called for in paragraph 329 AGC, or his designee, shall review the Section 4(f) determination for legal sufficiency. The document must reflect consultation with the Department of the Interior and, where appropriate, the Department of Agriculture or the Department of Housing and Urban Development.

g. Where wetlands are involved, the ND shall document the outcome of consultations with the U.S. Fish and Wildlife Service and the pertinent state resources agency.

h. Where affected properties are included in or eligible for inclusion in the National Register of Historic Places, the ND shall include: (1) If the effect is not adverse, documentation and outcome of consultations with the State Historic Preservation Office (hereafter SHPO) and evidence that the Advisory Council on Historic Preservation (hereafter ACHP) reviewed the determination of no adverse effect, and (2) if the effect is adverse, documentation and outcome of consultations with the SHPO and the ACHP, including a Memorandum of Agreement with the ACHP or account of actions to be taken in response to comments of ACHP.

307. Responsible officials.

a. At the field level, NDs shall be reviewed by pertinent staff and program offices, and may be approved by the Regional or Center Director.

b. Responsible officials shall send NDs originating in FAA headquarters to AEG and to AGC for review. After review for legal sufficiency by AGC, the Service or Office Director may sign the ND.

308. Coordination NDs are required to be coordinated outside of the FAA only where coordination is required by law or administrative directive (e.g., for Section 4(f), Section 106, or wetlands impact).

309. Distribution. A copy of the ND is filed in the office of the responsible official and a copy forwarded to the appropriate Service Director for review for consistency with the policy and procedures of this order. Service Directors may waive this requirement, subject to AEG concurrence.

310. Availability for public information. NDs are public information, and as such shall be made available upon request pursuant to FAA procedures.

311-315 Reserved.

SECTION 3. FORMAT OF ENVIRONMENTAL IMPACT STATEMENTS

316. Format

a. Heading of Environmental Impact Statements. Each EIS shall be headed as indicated below and shall state which public laws are applicable to the proposed action. For example: Department of Transportation, Federal Aviation Administration, (Originating Region, Office, Service or Center) Final (or Draft) Environmental Impact Statement (Subject) (Date).

This statement is submitted for review pursuant to the following public law requirements: Section 102(2)(C) of P.L. 91-910, 42 USC 4321; Section 4(f) of P.L. 89-670, Section 106 of the National Historic Preservation Act; etc. . . as applicable.

b. Summary. The format for the summary which shall accompany draft and final EISs is as follows:

Summary

() Draft () Final (Check one)
Department of Transportation, Federal Aviation Administration Name, address, and telephone number of individual who can be contacted for additional information about the proposed action or the statement

(1) Name of Action. (Check one) () Legislative () Administrative

(2) Brief description, purpose and location of action, indicating which State(s) and counties are particularly affected

(3) Summary of environmental impact and adverse environmental effects.

(4) List alternatives considered.

(5) For draft statements, list all Federal, State, and local agencies and any other sources from which comments have been requested.

(6) For final statements, list all Federal, State, and local agencies and other sources from which written comments have been solicited and received.

(7) Date(s) the draft statement and the final statement, if issued, were made available to the CEQ and to the public

(8) Date of the public hearing, if one was held.

c. Signature. Each DEIS and FEIS shall be dated and signed by the responsible official. 317-319. Reserved.

SECTION 4. CONTENT OF ENVIRONMENTAL IMPACT STATEMENTS

320. General. EISs document the consideration and evaluation of environmental impacts in FAA decision making.

a. The required information should be presented in easily understood language.

(1) Documents should be detailed, yet succinct, including analysis of all relevant environmental impacts of a proposed action and its reasonable alternatives.

(2) Analysis of facts, references to literature, special studies or textual material within the statement shall support conclusions.

(3) Do not include unnecessary information, and summarize, consolidate or reference less important material.

b. Although adherence to a rigid format is not required, preparation and review is facilitated by adhering to typical presentation styles.

(1) The document should refer at appropriate points to any underlying studies, data sources, or other information considered in its preparation.

(2) Reference data need not be attached but shall be listed and made available to the responsible official or any member of the public upon request.

321. Description.

a. Each EIS shall begin with a concise description of the proposed Federal action, a statement of its purpose, a brief summary of the need for the action, and an indication of any related contemplated actions. The description also shall contain or refer to figures, charts, photographs, or tables in the document as necessary to illustrate the action to be taken, and any significant airport or facility community environmental interfaces. All illustrations and reproductions should be legible, free of clutter, and in a form which is understandable. Airport development actions shall include foreseeable related facility installations and procedural actions. Facilities actions not involving airport development shall include foreseeable related procedural actions.

b. The document shall identify any other Federal activity in the affected area which is related to the proposed action (e.g., highways, housing relocation). It shall include a description of the interrelationships and cumulative environmental impacts of all related Federal projects in planning and development.

c. The document shall indicate how the proposed action conforms to or conflicts with the specific terms of adopted Federal, State, regional, or local land use plans, policies, and controls, which include state coastal zone management programs, if any, for the area affected. Actions should be consistent with these plans, policies, and controls to the maximum extent possible. Efforts to reconcile any conflicts or inconsistencies also shall be described, along with the results achieved.

322. Background information. A section describing or discussing background information may be appropriate. This section should highlight related developments to date and present a general overview of significant aspects of the situation under review. It may include such items as bond actions, action pertinent to the proposal by the community or citizen groups and any other unique and significant factors associated with the project.

323. Probable impacts. The document shall describe and appraise relevant probable impacts, both beneficial and adverse, of the proposed actions on the human and natural environment and shall:

a. Include those adverse effects which cannot be averted should the proposal be implemented,

b. Describe the actions to be taken to enhance beneficial impacts; and

c. Document the assessment of all relevant environmental factors in paragraphs 324 to 343 to the extent necessary to consider the environmental impacts of a proposed action and its alterations.

324. Noise.

a. Background.

(1) The purpose of noise analyses is to present information about the effects of noise on noise sensitive areas;

(2) Because noise effects vary with different human activities, the appropriate quantitative measure or descriptor of noise

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exposure may vary, depending on the activity under discussion and the availability of substantive scientific data relating noise level to impact on humans.

(3) This section refers to three measures of noise exposure any one or more of which may be required, depending on the circumstances:

- (a) Peak level in dB(A);
- (b) Duration above a reference noise level in minutes or other time measure, and
- (c) An aggregated noise measure, such as Composite Noise Rating (hereafter CNR), Noise Exposure Forecast (hereafter NEF, Day/Night Level (hereafter Ldn) or Equivalent Noise Level (hereafter Leq).

b *Requirements* The analyses shall include information for three conditions: the present condition, the condition forecast WITHOUT the proposed change; and, the condition forecast WITH the proposed change. All interrelated actions (e.g., installation of navigation aids and air traffic control procedures) shall be considered.

(1) For actions involving airport location, runway location, major runway extension, or runway strengthening which would permit operation by larger or noisier aircraft, the following noise information shall be presented:

(a) Continuous contours showing the boundaries of all areas exposed to noise levels equal to or greater than NEF 30, or Ldn 65, or CNR 100

(b) This paragraph is effective ----- (one year from the approval of this directive) It applies to DEISs and NDs filed 12 months after the effective date of this Order, and to FEISs filed 24 months after the effective date of this Order.

For noise sensitive areas identified in (a) if the proposed action is highly controversial because of noise impacts or if they will be exposed to jet operations for the first time, or if the noise increase is greater than 3 units (NEF, Ldn, CNR), then for those areas (for the future condition with the proposed project and the future condition without the proposed project) provide average duration above 65, 75, 85, 95, 105, and 115 dB(A) for a complete day's operation, for the evening period, (7 pm-10 pm) and for the night period (10 pm-7 am). This information may be provided on a discrete basis for selected points in intervals of not more than 3,000 feet. For these same points provide NEF, Ldn, or Leq.

(2) For new jet arrival or jet departure tracks (Arrival or departure tracks are flight segments within 3,000 feet above the surface) the following noise information shall be presented for noise sensitive areas:

- (a) The information described in 1 (a) and (b); or
- (b) Peak noise level and frequency of occurrence for total daily, evening and night periods for selected points in intervals of not more than 3,000 feet.
- (3) For actions other than c (1) and (2), for example, intermittent stationary sources (e.g., cooling towers) or mobile sources (non-jet aircraft in flight, aircraft taxiing or surface vehicles) provide peak noise levels and frequency of occurrence at noise sensitive areas.

(4) For stationary sources which produce relatively steady levels of noise, provide noise level and duration at noise sensitive areas.

(5) Policy, administrative, and regulatory actions, particularly those which are environmentally protective with effects dispersed across the air transportation system, may not reasonably be assessed using traditional noise analyses methods. In such cases, the analyses may use innovative methods. This, however, does not diminish the preparer's principal responsibility for assuring and defending the adequacy of the analyses.

c *Exceptions.*

(1) Unless required by section b (1), noise analysis is not required for those actions which cause increases of less than 2dB or 1 unit NEF and is not controversial. There are respectively

(a) Actions which result in reductions in distance between the noise source and noise sensitive areas of less than 20% (without change in the noise characteristics of the source) and which do not expose new land areas to noise

(b) Any action that does not increase total daily operations by more than 25% along any arrival or departure flight track (runway utilization rates, ratio of day-to-night operations and the relative proportions of different aircraft types remaining unchanged).

(2) However, all actions which cause the accumulated, incremental changes to exceed the limits of c (1) require a noise analysis. Accumulation may be computed starting with the approval date of this Order or the date of the last prior analysis under 324b, whichever is later.

d *Format*

(1) The presentation of noise analysis shall be intelligible to lay and technical readers

(a) The text shall present principal findings

(b) Detail required to derive the findings shall be included in appendices, but shall also be referenced in the text

(2) The following graphics are required where an action falls under 324b.(1):

(a) Layout plan of the present and, where relevant, proposed airport, and

(b) A map of the airport vicinity including the following for each condition analyzed:

- 1 runway location and orientation;
- 2 flight tracks used in the analysis;
- 3 land use, present and planned;
- 4 noise sensitive areas, by type;
- 5 zoning, proposed property acquisition, or other land use controls; and
- 6 prominent legible noise exposure data.

(3) Analyses under 324b (2) and b (3) and b (4) require all relevant items under (2)(b) above but in no case less than item (b)3, (b)4, and a convenient display or cross reference of the noise information to the locations to which it applies

e *Analysis.* The general literature on the effects of noise on man and on recommended land use or exposure criteria varies in depth, breadth, accuracy and reliability. The use of such information is an effort by the FAA to make the state-of-the-art visible to the public. The information, therefore, should permit lay and technical readers to relate noise exposure data to an understanding of its potential effects. Accordingly, the following analysis is required.

(1) A description, in terms suitable for lay and technical readers, of the noise descriptors used in the analysis both for single event measures (for example peak noise levels) in dBA, EPNdB, PNdB and cumulative measures (for example CNR, Ldn). The explanation of the descriptors shall convey the technical as well as the conceptual significance of the noise measures

(2) A discussion of

(a) any non-standard data or calculation procedures used or derived for the purpose of dealing with any unique aspect of the analysis,

(b) clear and concise references to source data or procedures, and

(c) noise from other than aircraft operations if the additive effect is significant

(3) An analysis describing the expected noise exposure of each noise sensitive activity in the area with the following considerations:

(a) A discussion of noise impact for each noise sensitive area, including such information as the number of people and schools and the size of residential land area exposed to specified noise levels, describing any incompatibility between the noise and existing or planned land uses (e.g., residential, cultural, religious, educational, industrial, agricultural, or recreational)

(b) The analysis shall, to the extent reasonable, discuss potential effects of noise and hearing, communications interference (with consideration to educational, occupational, recreational, and religious activities), sleep interference, and annoyance, both within the context of outdoor activities as well as indoor activities.

(c) Consideration shall be given to the amount of acoustical protection provided by construction and architectural characteristics as well as climatological situations which might affect life styles and therefore alter the "average" interpretations placed on the effects of noise.

f *Records* The proposing office shall assure that sufficient information is retained to permit an independent review to recreate the complete noise exposure analysis

325 *Air quality* Air quality should be examined by estimating the pollutant impact of the proposed action in terms of existing and forecast operations. Air pollutant concentrations as well as total amounts of pollutants should be estimated and evaluated, as necessary, for consistency with state implementation plans for air quality under the Clean Air Act and other State or local standards, EPA indirect source regulation (40 CFR 51.18), if applicable, and other applicable standards. Air pollution effects of increased surface traffic resulting from increased air traffic should be estimated and considered. Methods should be proposed or referenced for controlling and minimizing air pollution resulting from construction of the project

326 *Water quality.* Water quality requirements, available water resources, and impact on existing water tables should be considered. Facilities for treatment and disposal of wastes also should be considered and evaluated for consistency with applicable standards. Action taken to minimize pollution due to surface runoff, which may include pollution infiltration from areas of extensive grading and pavement or placement of piles, should be discussed. Short-term and long-term effects of construction upon area drainage and aquifers should also be discussed

327. *Social impacts.* A proposed action may have social and community impacts. Where displacement of people or businesses or disruption of established communities occurs, the following information from secondary sources and community sources, when available, should be included in order to determine the manageability of relocation:

a. An estimate of the numbers and the characteristics of households to be displaced (e.g., minorities, income levels, renter or owner, elderly, large families);

b. Impact on the neighborhood and housing where relocation is likely to take place,

c. Disruption or impact on the stability and cohesion of any established community;

d. A description of businesses to be displaced and general effects of business relocation on the economy of the community,

e. Ability to provide adequate relocation housing for the types of families to be displaced and a description of actions proposed to remedy any insufficiency, including, if necessary, housing of last resort, as authorized by Section 208(a) of the Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970.

f. Effects of surface traffic disruption including effects on access to community facilities

Appendix D. FAA Procedures (cont.)

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ilities, recreation areas, and places of residence and business.

g. Results of consultation regarding the impacts with local officials, relocation or other social agencies, and community groups.

h. A description of any special location advisory services to be provided for the elderly, handicapped, or illiterate regarding interpretation of benefits and other assistance available.

328. *Induced socio-economic impacts* These impacts may include shifts in the patterns of population movement and growth, public service demands, and changes in business and economic activity. The effects of these impacts should be estimated and discussed in consultation with pertinent local officials.

329. *Dot section 4(f)*. This section requires identification of and special effort to preserve public parks, recreation areas, wildlife and waterfowl refuges, and historic sites, and areas of natural scenic beauty of local, state, or national significance affected by the proposed action. The description should include size, activities, and relationship to other similarly used lands in the vicinity.

a. The use of public parks, recreation areas, wildlife and waterfowl refuges, and historic sites, must be avoided if there is a feasible and prudent alternative.

b. A publicly owned park, recreation area, refuge, or historic site is presumed to be significant unless there is a statement of insignificance by the Federal, State, or local official having jurisdiction thereof. Any such statement of insignificance is subject to review.

c. Where Federal lands are administered for multiple uses, the Federal official having jurisdiction over the lands shall determine whether the subject lands are in fact being used for park, recreation, wildlife, waterfowl, or historic purposes.

d. The discussion of the alternative of taking no action and of alternative designs and locations shall include cost estimates with figures showing percentage differences in total project costs and technical feasibility assessments.

e. Analysis of the environmental impact of alternatives shall include evidence that unusual factors or unique problems are present and that the cost or community disruption resulting from alternatives reach extraordinary magnitudes.

f. If there is no feasible and prudent alternative to the use of such land, include a statement of actions taken or to be taken to minimize harm to the protected area. This may include using project funds to replace or improve land and facilities and designing measures such as planting or screening to mitigate any adverse effects. Also include evidence of other measures to enhance and maintain natural beauty.

g. If land is involved which was acquired with Federal grant money (i.e., open space under Department of Housing and Urban Development, various conservation programs under Department of Interior), the final documentation shall include an appropriate communication or finding from the grantor agency.

h. The documentation shall reflect consultation with the Department of the Interior and, as pertinent, the Department of Housing and Urban Development or the Department of Agriculture.

i. The document shall include a statement that there is no feasible and prudent alternative to the use of the land and that the action includes all possible planning to minimize harm.

j. Questions regarding the application of Section 4(f) should be referred to AEG.

330. *Historical and archaeological sites*. The document should specify actions to be taken to preserve and enhance districts,

sites, buildings, structures, and objects of historical, architectural, archaeological, or cultural significance affected by the project.

a. The statement should identify, through consulting the National Register of Historic Places and National Register Criteria (36 C.F.R. Part 800), whether proposed actions will affect properties included in or eligible for inclusion in the National Register.

(1) The National Register of Historic Places is published each February in the *FEDERAL REGISTER*.

(2) Monthly additions and listings of eligible properties are published in the *FEDERAL REGISTER* the first Tuesday of each month.

(3) The Secretary of the Interior will advise, upon request, whether properties are eligible for the National Register.

b. If application of the ACHP's Criteria of Effect indicates that the project will affect a property included in or eligible for inclusion in the National Register of Historic Places, the document should state the effect.

(1) Evaluation of the effect should be made in consultation with the SHPO and in accordance with the ACHP's Criteria of Adverse Effect (36 C.F.R. Part 800).

(2) Determinations of no adverse effect should be documented with evidence of the application of ACHP's Criteria of Adverse Effect, the views of the SHPO and review by the ACHP.

c. If the project will have an adverse effect upon property included in or eligible for inclusion in the National Register of Historic Places, the FEIS must include either an executed Memorandum of Agreement or comments from the ACHP with an account of actions to be taken in response to these comments. Procedures for obtaining a Memorandum of Agreement or the comments of the Council are found in 36 C.F.R. Part 800.

d. To determine whether the project will affect properties of state or local historical, architectural, archaeological, or cultural significance that are not included in or eligible for inclusion in the National Register, the responsible official should consult with the SHPO, with the local official having jurisdiction of the property, and where appropriate, with historical societies, museums, or academic institutions having expertise with regard to the property.

e. Use of land from historic properties of Federal, State, and local significance, as determined by the official having jurisdiction thereof, involves Section 4(f) of the DOT Act. The document should include evidence necessary to support a Section 4(f) determination.

f. Any foreseeable irreplaceable loss or destruction of significant scientific, prehistoric, historical, or archaeological data shall be identified in the document, with evidence of notice provided to the Secretary of the Interior and measures described to undertake the recovery, protection, and preservation of such data, including preliminary survey, salvage, or other investigations as needed. The FAA has an agreement with the Department of the Interior for assuring compliance with the Archaeological and Historic Preservation Act of 1974, providing for oversight relative to mitigation of damage to archaeological and historic data incident to construction activities of FAA or FAA assisted projects.

331. *Flood hazard evaluation*. To comply with Executive Order 11296 and Flood Hazard Guidelines for Federal Executive Agencies, promulgated by the Water Resources Council, describe measures to handle flood hazard problems and how they can be implemented during project development. When a project under consideration encroaches on a flood plain, the EIS should include evidence

that studies have been made and agencies have been consulted.

332. *Considerations relating to wetlands*. Where impacts on wetlands, including control, modification, impoundment, diversion, and channel deepening of streams or other bodies of water are involved, the document should include:

a. Information on location, types, and extent of wetlands areas that might be affected by the proposed action;

b. An assessment of the impacts on the wetlands and associated wildlife from both construction and operation of the project;

c. A statement of the measures to be taken to preserve, protect and enhance wetlands and to avoid, to the fullest extent practical, drainage, filling, or interference with wetlands or the water resources supplying them;

d. Results of coordination with the local representative of the Department of the Interior, the Department of Commerce, and any other officials such as the Corps of Engineers with special expertise concerning the impacts of the project on the wetlands and the worth to the community and to the nation of the particular wetlands area involved; and

e. A statement as to whether the proposed action should proceed and upon what conditions.

333. *Coastal zone management programs*. Where the proposed action is within or may affect the land or water uses in the area covered, by a state coastal zone management program, the document shall include evidence of consultation with the state coastal zone management agency. If a state coastal zone management program has been approved by the U.S. Department of Commerce, the statement shall include the following:

a. For FAA assisted actions, include a determination as to consistency with the approved state coastal zone management program. Also include a record of coordination as specified in the Coastal Zone Management Act, and evidence that necessary permits, if required, will be or have been secured.

b. If the proposed action is issuance of a FAA license or permit, the applicant shall provide a certification that the proposed action complies with the state's approved program and that such activity will be conducted in a manner consistent with the program. The document shall include a record of coordination with the state coastal zone management agency.

c. If it is determined that the proposed project is inconsistent with the state's approved program, the responsible official shall not approve the action except upon a finding by the Secretary of Commerce that the proposed action is consistent with the purposes or objectives of the Coastal Zone Management Act or necessary in the interest of national security. The EIS shall document this finding.

334. *Energy supply and natural resources development*. Where applicable, the report should reflect consideration of whether the project will have any effect on either the production or consumption of energy and other natural resources, and include the analysis of any such effects if they are significant.

335. *Construction impacts*. In general, adverse impacts during construction will be of less concern than long-term impacts of a proposal. Nonetheless, the report should appropriately address such matters as the following, identifying any special problem areas:

a. Noise impacts from construction or delivery of materials through residential areas and any specifications providing maximum noise levels;

b. Effect of spoil disposal on borrow areas and disposal sites (include reference to pertinent specifications),

Appendix D. FAA Procedures (cont.)

c. Controls on air pollution from dust, burning, etc. (with reference to pertinent specifications or advisory circulars); and

d. Impacts on water quality from run-off and associated sedimentation and control measures (reference specifications or advisory circulars)

336 *Wildlife and waterfowl.* Long-term loss may accrue by virtue of reduction of the overall wildlife carrying capacity of a given land area. Where part of a wildlife habitat is removed it should be determined whether the remaining habitat is sufficient. These long-term losses may be described in general terms unless a threatened or endangered species is involved.

337 *Impacts relating to endangered and threatened species of fauna and flora.* The document should include evidence that the proposed action will not jeopardize the continued existence of endangered or threatened species or result in the destruction or modification of critical habitat of these species.

a. If any species listed by the Department of the Interior as endangered or threatened exist in the area of the proposed action's potential impact, the document should provide evidence of consultation with the Regional Director of the Fish and Wildlife Service (hereafter FWS) or the National Marine Fisheries Service (hereafter NMFS), as appropriate, regarding the impacts of the action on the species. The FWS, Department of the Interior, is responsible for protection of terrestrial and freshwater species; the NMFS, Department of Commerce, is responsible for protection of marine species.

b. The document should describe the anticipated effects of the proposed action and alternatives to the action on listed species, the nature of the listed species' habitat, and whether the FWS or NMFS has determined that habitat to be critical.

c. The final statement should summarize the results of consultation with FWS or NMFS and indicate any specific measures which will be taken to conserve listed species and to avoid destruction or modification of critical habitat.

338 *Light emissions.* Aviation lighting required for the purposes of security, obstruction clearance, and navigational guidance, may create an annoyance among people in the vicinity of the installation. In this instance, documentation shall include:

a. Site location with a diagram of lights or light system.

b. Description of lights, as to their purpose, installation, beam angle and measurements, intensity, color, flashing-sequence, and other pertinent characteristics of the particular system and its use.

c. Measures to lessen any annoyance, such as shielding or angular adjustments.

339 *Visual impacts.* Any special significant visual impacts shall be described, particularly in areas of natural beauty or historic or architectural significance.

340-343 *Reserved.*

344. *Actions to minimize unavoidable adverse effects.* Actions to be taken to minimize unavoidable adverse effects should be described.

345. *Alternatives.* An EIS or, as appropriate, an ND thoroughly and objectively evaluates the environmental impact of all reasonable alternatives, particularly those which mitigate environmental impacts; and sets forth the reasons why the alternatives are rejected.

a. *Sufficient analysis* of the environmental impact of the alternatives should accompany the proposed action through the review process in order not to foreclose prematurely options which might enhance environmental quality or have a less detrimental effect.

b. *Alternatives include* taking no action or postponing action pending further study; rejection of these alternatives requires an examination of the need for the project and the consequences of taking no action.

c. *Where appropriate,* satisfying the increased transportation needs by using alternative transportation modes should be considered.

346 *Relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity.* The document must examine the extent to which the proposed action involves tradeoffs between short-term environmental gains at the expense of long-term losses and long-term gains at the expense of short-term losses and the extent to which the proposed action forecloses future options.

347. *Irreversible and irretrievable commitments of resources.* The document must examine the extent to which the proposed action would irreversibly and irretrievably curtail the range of beneficial uses of the environment including cultural as well as natural resources. If a project involves new, unusual or limited sources or types of materials, include a quantitative estimate and description. Normally, labor and materials required to accomplish a project do not significantly curtail the range of beneficial uses of the environment.

348 *Citizen involvement.* Document a summary of citizen involvement, including meetings and public hearings, and any environmental issues raised.

349 *Summary of impacts.* A summary of the conclusions and significant points developed is desirable.

EXCERPTS FROM NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
"GUIDELINES FOR CONDUCTING ASSESSMENTS AND PREPARING ENVIRON-
MENTAL STATEMENTS REQUIRED BY THE NATIONAL ENVIRONMENTAL POLICY
ACT OF 1969," NMI 8800.7C, APRIL 10, 1974.

*5. ENVIRONMENTAL ASSESSMENTS

- a. Purpose of Assessment. The NEPA requires that NASA take environmental factors into consideration in planning, decisionmaking, and implementing its actions. Thus, the consideration of environmental impact must be a part of the formulation and definition of all new or revised agency activities. The environmental assessment is the process by which the environmental effects of proposed actions are initially identified and analyzed for inclusion throughout the decision process.
- b. Responsibility. The Official-in-Charge of each Headquarters Office shall provide for an assessment of the environmental impact of each major action which he proposes or which is to be taken under his programmatic or institutional cognizance (See Section 102(2) of the NEPA and Sections 1500.2, 1500.5 and 1500.6 of the CEQ Guidelines.). The NASA employee initiating an action is responsible in the first instance for assessing, or obtaining an assessment of, its environmental impact. Each NASA official having authority over the action, including the authority to recommend the proposal to higher management levels for review and decision, is responsible for the adequacy of the assessment supporting his decision or recommendation on the proposed action.
- c. Extent of Assessments
 - (1) The basic criteria to be used in determining whether proposed legislation, projects, or activities have the potential to have a significant effect on the quality of the human environment appear in Sections 1500.6 and 1500.8 of the CEQ Guidelines and in CMB Bulletin 72-6.
 - (2) Section 101(b) of the NEPA (42 U.S.C. 4331(b)) indicates the broad range of environmental objectives to be considered in any assessment of significant effect. Significant effects on the quality of the human environment include both those that directly affect humans and those that indirectly affect them through effects on the environment. These are amplified in Section 1500.8(a)(3) of the CEQ Guidelines. The Associate Deputy Administrator will provide supplemental guidance on a continuing basis to acquaint NASA officials and employees with the aspects of the environment to be considered in assessments, and the kinds of actions to be covered by assessments.

- (3) Section 102(2)(A) of the NEPA establishes the requirement for a multidisciplinary approach in planning and decisionmaking, the results of which may have an impact on man's environment. This requirement, discussed in Section 1500.8(c) of the CEQ Guidelines, is to insure "the integrated use of the natural and social sciences and the environmental design arts" in such planning and decision-making.
- (4) Good judgment and reason are to be used in applying the above criteria in the consideration of environmental effects. Where there is no essential impact, and that fact is readily determinable, the statement of that fact is adequate. In other areas, major studies may be required.

d. Timing of Assessments

- (1) Section 1500.2 of the CEQ Guidelines requires that assessments be conducted concurrent with initial technical and economic studies. This permits the environmental consequences of the proposed action to be considered throughout the decisionmaking process. Thus, environmental assessment must be a part of the earliest thinking about possible major actions, and must be a part of any rethinking based on new or more complete information bearing on environmental impact.
- (2) It should be noted that, especially in R&D projects, major parameters of environmental significance are, and must be, settled as a result of research, exploratory development, and performance decisions which necessarily follow the decision to engage in the project. Therefore, some NASA assessments (and their documentation) are likely to be incomplete as a result of either sub-project decisions yet to be made or technical assumptions which may be revised as development takes place. Documentation of an assessment must mention its own deficiencies and the activities planned to overcome them. The assessment and its documentation are then subject to continuing revision as warranted by changing performance factors and technical assumptions. Awareness of the need for continuing reassessment of environmental effects is of utmost importance.

- e. Documentation of Assessments. All assessments shall be made a matter of record, even though many assessments will not lead to environmental impact statements. In some instances, the needed documentation may be a simple statement that there is no essential environmental impact. In other cases, major reports may be required. The general rule to be applied is that the documentation should thoroughly cover and, at the same time, be limited to the foreseeable environmental consequences of the proposed action. Where it appears likely that a new or revised environmental impact statement may be required, the documentation of the assessment or reassessment should be in the form of such a statement, as explained in paragraph 6 and Section 1500.8 of the CEQ Guidelines. Where an existing statement adequately covers the proposed action,

Appendix E. NASA Guidelines (cont.)

the applicable statement should be identified. In all cases, the documented assessment of environmental effects shall be considered by management along with all other factors at each step of the decision process. The Official-in-Charge of the Headquarters office having direct management responsibility over the proposed activity will provide for maintaining the assessment documentation.

- f. EPA Review of Certain Assessments. If the subject of the assessment involves the authorities of the Administrator of the Environmental Protection Agency with respect to water and air quality, solid waste, pesticides, radiation, noise, etc.; if it may be considered to come within the scope of Section 309 of the Clean Air Act, as amended (42 U.S.C. 1857 et seq.); and if it appears that no formal environmental impact statement is required; the assessment shall be submitted to the Associate Deputy Administrator. This will be transmitted when appropriate to the Environmental Protection Agency for comment under Section 1500.9(b) of the CEQ Guidelines. When it appears that a formal environmental impact statement is required, this separate submittal to EPA is not required; EPA review required by the statute will be fulfilled by their review of the statement itself as required by paragraph 7(d) of these instructions and Section 1500.9(b) of the CEQ Guidelines.

*6. ENVIRONMENTAL IMPACT STATEMENTS

- a. Decision to Prepare. The decision whether or not to prepare an environmental impact statement is made by the Official-in-Charge of the Headquarters Office having direct management responsibility over the proposed activity, and is a direct product of an evaluation of the assessment. Section 1500.6 of the CEQ Guidelines provides basic guidance for this decision. The Associate Deputy Administrator will provide the necessary overall guidance for the agency. The Official-in-Charge of the Headquarters Office having direct management responsibility over the proposed activity will maintain a list of decisions to prepare or not to prepare an environmental statement as part of his assessment documentation. Notice of each decision to prepare an environmental impact statement shall be submitted in writing to the Associate Deputy Administrator or his designee as soon as is practicable after that decision is made. In keeping with Section 1500.6(e) of the CEQ Guidelines, the Associate Deputy Administrator will maintain a master list of all such statements in process within NASA, provide this list to CEQ quarterly, and make it available to the public as required.
- b. Nature and Purpose. The environmental impact statement documents those environmental analyses of major actions having the possibility of significant impact upon the environment. Each statement is developed as a draft, circulated for review inside and outside the Agency, and then put in final form. The environmental impact statement is the most formal version of a documented assessment and provides the environmental information that must be considered throughout the decision process

Appendix E. NASA Guidelines (cont.)

c. Types of Statements.

- (1) Section 1500.2(a) of the CEQ Guidelines divides assessments (and subsequent statements) into two classes: (a) those relating to legislative actions, and (b) those relating to all other major Federal actions, which CEQ terms "administrative actions." As applied to NASA, this distinction is drawn between those actions requiring Congressional approval in the form of enabling legislation (authorization or appropriation), and those discretionary actions which may be taken by or for NASA within the scope of an existing authorization or appropriation.
- (2) In Section 1500.6(d), CEQ crosscuts these with a distinction between "broad program statements" and "statements on major individual actions." Broad program statements are therein defined as covering "the environmental effects of a number of individual actions on a given geographical area (e.g., coal leases) or environmental impacts that are generic or common to a series of agency actions (e.g., maintenance or waste handling practices), or the overall impact of a large-scale program or chain of contemplated projects (e.g., major lengths of highway as opposed to small segments)."
- (3) NASA has, since 1971, provided for a somewhat different distinction through its "Institutional Statements" and "Program Statements." The institutional statements have recognized the operation of each NASA field installation as a "major Federal action" consisting of coherent and continuing bodies of R&D effort. The NASA program statements have covered the major development and flight programs of the Agency. These statements have provided for maximum coverage of NASA activities with a minimum number of broad statements. Most NASA program and institutional statements tend to be "broad program statements" by the CEQ definition, though not in every case.
- (4) These broad statements do not eliminate the need for continuing awareness and reassessment of the environmental impact of included activities or facilities. They do, however, permit subsequent assessments and reassessments to focus on relatively circumscribed activities or facilities. When such an assessment or reassessment so indicates, NASA will prepare a separate statement on a major individual action or facility coming under the umbrella of the institutional or program statement. Such a statement may be prepared as an amendment or supplement to the existing program or institutional statement or may stand as a separate statement, as determined by the Official-in-Charge of the responsible Headquarters Office.

Appendix E. NASA Guidelines (cont.)

d. Content.

- (1) Section 1500.8 of the CEQ Guidelines presents a detailed discussion on the expected content of an environmental statement, including eight particular items which should be considered in drafting the environmental statement. These eight items, discussed in Section 1500.8(a) of the CEQ Guidelines, provide a convenient, although not mandatory, format for the statement.
- (2) Section 1500.8(d) of the CEQ Guidelines requires that a summary sheet of prescribed form (Appendix I of the CEQ Guidelines) accompany each draft and final environmental impact statement. Section 1500.8(b) of the CEQ Guidelines contains additional guidance as to the contents of the statement and its relationship to fundamental documentation. However, care should be taken to ensure that the statement can be understood without undue reference to attachments or other documents.

- e. Timing. Environmental impact statements are drafted when an assessment has indicated the need and a responsible management official (see paragraph 6a) has determined that the statement shall be prepared. Sections 1500.9(f), 1500.11(b), and 1500.11(c) of the CEQ Guidelines provide minimum intervals for interagency and public review of draft statements (45 days), and between issuance of a final statement and the taking of action on the activity proposed therein (30 days). The overall minimum of 90 days required from release of the draft statement to taking of the subject action is of special significance; during that period comments are received, the necessary changes made, and the final statement released. These steps can require a significantly longer time. Furthermore, where impact statements are required on legislative proposals (e.g., authorization and appropriation requests), Section 1500.12 of the CEQ Guidelines requires that they should be prepared (drafted) before the legislative proposal is sent to OMB for clearance. A continuing awareness of the time factors is essential if NASA is to meet its obligations in environmental protection and enhancement without unnecessarily deferring other program action.